INCOVER
Innovative Eco-Technologies for Resource Recovery from Wastewater

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Innovative Eco-Technologies for Resource Recovery from Wastewater

INCOVER

Deliverable D4.4

Report on the contribution to the standardization

Work Package 4

DSS development and Sustainability Analysis

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Executive summary

This report constitutes Deliverable D4.4, which is part of Task 4.4 "Standardization activities" inside WP4 "Decision support system development and sustainability analysis" and is based in the conclusions of D4.1 'Report on the standardization landscape and applicable standards' that included the information on the relevant existing and ongoing standards and the relevant standardization technical committees to facilitate the use of existing knowledge and the compatibility and the interoperability of the INCOVER developments and thus facilitate the acceptance and utilization by the market of the developed solutions.

The purpose of this report D4.4 is to describe the interactions developed with the standardization Technical Committees and opportunities identified to contribute to the ongoing and future standardization developments, following the feedback received from INCOVER partners on D4.1.

1 Introduction

1.1 Background to D4.4

When the INCOVER project started only few partners acknowledged being aware of the complexity of standardization activity, a horizontal issue that was addressed in Work Package 4 'Decision Support System (DSS) development and Sustainability Analysis'.

Standards were perceived as a necessary and helpful tool for their day-a-day operation, i.e. their experience was as users of the existing standards in their processes. However, in general terms partners had limited knowledge about the standardization activity, how to contribute to the standards development, and the further implications of getting engaged in the standardization work.

Then deliverable D4.1 introduced the diversity of actors in the field of international and international standardization work, and characteristics of the different types of normative documents. Information on the most relevant Technical Committees (TCs) was provided, listing standards references for the main topics identified for the fields related with the INCOVER project and the expected products, under the following key concepts:

- Wastewater treatment, Wastewater plants
- Bio-chemicals, Plastics, Bio-plastics
- Irrigation, Irrigation water, Water quality
- Fertilizers, Bio-fertilizers
- Gas fuels, Bio-gas fuels, Bio-methane
- Residues (sludge)

The initial search made by UNE over 2500 European standards was filtered, focusing on 9 European TCs, compiling information on their scope, environmental activities, substructure, published standards and standards under development, identifying a list of over 1200 published and under development standards potentially relevant for INCOVER.

D4.1 presented information on the standardization landscape, to provide information for not only WP 4 but for other WPs, enhance the compatibility and interoperability of INCOVER developments and thus facilitate the acceptance and utilization by the market of the developed solutions.

1.2 Actions following D4.1

The first version of the report on the standardization landscape and applicable standards received comments from some INCOVER partners, not on the applicability of the existing standards but regarding the existence of specific standardised solutions.

Subsequently UNE resolved diverse queries of the INCOVER project partners on specific areas of interest, such as:

- Geosynthetics & geotextiles
- Biogas
- Water reuse & sludge recovery
- Algae
- Smart irrigation

Following the feedback received from INCOVER partners on D4.1, the search conducted by UNE expanded to international TCs and specific information was additionally provided to INCOVER partners. This further information was included in a second version of D4.1.

Figure 1 summarises the standardization topics where INCOVER partners showed interest and that guided UNE to approach the relevant TCs, as follows:

- TREATMENT PLANTS DESIGN: Geotextiles, Construction Products Regulation, Standardization requests & harmonised standards
- FERTILISERS: Phosphorus recycling; New EU Regulation on Fertilisers; Standardization requests & harmonised standards
- WASTE WATER TREATMENT: Vocabulary
- WASTE WATER MANAGEMENT: Smart City Platform
- SMART IRRIGATION SYSTEMS: IoT & Communication protocols; Smart agriculture
- WATER REUSE: Technologies

Figure 1. INCOVER partners feedback on fields of interest in standardization

2 Scope

2.1 Purpose and objectives

D4.4 contains the description of the interactions developed with the standardization Technical Committees and contributions to the ongoing and future standardization developments in those areas demanded by INCOVER partners.

It identifies opportunities for future collaborations and includes proposals for shaping the future standardization environment in the field.

According to the feedback and specific queries received from INCOVER partners on D4.1, UNE analysed the type of interaction that INCOVER could have with the relevant standardization structures, in order to use the standardization system as a tool for dissemination of the project results and for interaction with the market stakeholders.

The search conducted by UNE deepened not just on the activity of the relevant TC but on the potential contribution of INCOVER to the standardization work. The findings were offered to INCOVER partners along with the diverse options to get engaged. UNE offered advice and technical support in this regard.

2.2 Scope of the contribution

The standardization system was used as a targeted dissemination channel of INCOVER outcomes towards the stakeholders represented in the standardization committees.

The contribution from the INCOVER project to standardization was challenged by external and internal factors:

- the level of development of the results obtained in the project
- the interests of the partners
- the feedback received from the TCs contacted

The demand for interaction was limited due to the time constraints of the INCOVER project that made not possible to produce public deliverables that could be submitted to the relevant TCs as an innovative input to their standardization works.

In this regard partners were also advised that Intellectual Property Rights (IPRs) on the INCOVER outcomes should be carefully considered for further contribution to the standardization work, as standards organizations have implemented a Patent Policy that encourages the early disclosure and identification of Patents that may relate to standards under development. In doing so, greater efficiency in standards development is possible and potential patent rights problems can be avoided. Annex A gives guidance on the Common Patent Policy for ISO/IEC/ITU.

3 Approach methodology

3.1 Actions taken for direct access to the relevant TCs

According to the feedback and comments received to D4.1, UNE gained access to those TCs with a scope or work programme more directly related to the interests of the INCOVER project partners and detailed in subclause 1.2 (Figure 1). This included the following:

a) Europe:

- CEN SRAHG Fertilisers, CEN/TC 223, CEN/TC 260 'Fertilizers and liming materials', & CEN/TC 455 'Biostimulants'
- CEN/TC 189 'Geosynthetics'
- CEN/TC 308 'Characterization and management of sludge'
- CEN/TC 334 'Irrigation techniques' (34 std), CEN/TC 230 'Water analysis' (382 std)
- CEN/TC 334/WG 9 'Remote monitoring & control for irrigation systems'
- CENELEC/TC 57 'Power systems management and associated information exchange'
- ETSI-ISG Context Information Management (CIM)
- CEN-CENELEC-ETSI SF-SSCC Smart sustainable Cities & Communities; European Innovation Partnership on Smart Cities (EIP-SCC)

b) International:

- ITU-T SG20 'Internet of things (IoT) and smart cities and communities'
- ISO/TC 23/SC 18 'Irrigation and drainage equipment and systems'
- ISO/TC 221 'Geosynthetics'
- ISO/TC 282 'Water reuse'
- ISO/TC 275 'Sludge recovery, recycling, treatment and disposal'
- ITU-T SG20 'Internet of things (IoT) and Smart cities and communities (SCC)'

According to the INCOVER preferences shown in Figure 1, UNE carried out a deeper research, initially on a documental basis. Later on UNE also successfully established direct contact with the relevant management team of the TC (see Annex C) in order to have a better understanding of their activity and potential standardization gaps.

At this point it is worth recalling that, besides the cooperation between European and International TCs already explained in Deliverable D4.1, there are several mechanisms for cooperation between European Technical Committees:

- Mode 1 – Informative relation

- Mode 2 – Contributive relation
- Mode 3 – Sub-contracting relation
- Mode 4 – Collaborative relation
- Mode 5 – Integrated relation

4 Analysis & main findings

4.1 Waste water treatment plants design

Under German lead, CEN/TC 165 'Wastewater engineering' is the main European actor on functional standards, standards for performance and installation in the field of wastewater engineering for systems and components. Also develops standards for design, calculation, construction, commissioning, operation and maintenance in the field of wastewater engineering, from the point of origin up to the point of disposal, including treatment plants and use of treated wastewater.

However, the linkage to INCOVER outcome on fertilising products is limited because its scope excludes the use of treated wastewater for agricultural irrigation purposes.

Likewise, CEN/TC 165/WG 50 "Use of treated wastewater" is discarded as it is focused on systems for the use of rainwater or treated greywater.

CEN/TC 165 is a highly demanding Committee and has already been approached by a few H2020 projects requesting the endorsement of specific outcomes (public final deliverables), e.g. H2020 ENERWATER project report on energy efficiency for waste water treatment plants will be converted into a CEN Technical Report; on the other hand, H2020 REMEB project output (low cost recycled ceramic membrane bioreactor for water reuse in a Wastewater Treatment Plant) was deemed not appropriate for conversion to a TR or standard at this time.

INCOVER project partners did not request such dissemination of any project outcome. However, partners highlighted the challenging use of the most appropriate materials for creating waterproof ponds for water with heavy load of nutrients and organic matters, to avoid bad practice that may harm the environment. European standards in the field are developed under standardization mandates from the European Commission to CEN and strongly linked to the Construction Products Regulation (to develop harmonised standards). The current work programme on geotextiles & geosynthetics TCs (CEN/TC 189, ISO/TC 221) do not offer a holistic approach to establish best practices in the selection of sizes and material types, thickness of liners/ membranes, etc. depending on the features of the land, installation for the functionality requested for the INCOVER project, etc.

ACTION PROPOSED
The relevant INCOVER partners could contribute with their experience to the standardization of the terminology in the field of wastewater engineering (CEN/TC 165/WG 30, EN 16323:2014 Glossary of wastewater engineering terms).

Also contribution could be made to:

- the serie of standards EN 12255 on "Wastewater treatment plants > 50 PT" (CEN/TC 165/WG 40)
- best practices in the selection of materials (informative annex to EN 13254:2016, new Technical report or CWA).

4.2 Bio-fertilisers

One of the European Commission's objectives is to encourage large scale fertiliser production from domestic organic or secondary raw materials in line with the circular economy model, by transforming waste into nutrients for crops. The EU has just published the new regulation (EU) 2019/1009 for placing fertilising and other products on the EU market (replacing the EC Fertilisers Regulation 2003/2003), that entered into force on 15th July 2019, and most of its rules will start to apply in 3 years, on 16th July 2022.

The scope of the harmonisation has been extended in order to include recycled and organic materials, considering that an increased use of recycled nutrients would further aid the development of the circular economy and allow a more resource-efficient general use of nutrients, while reducing Union dependency on nutrients from third countries.

The new Regulation acknowledges that it has been identified a market demand for the use as fertilising products of certain recovered wastes, such as struvite, biochar and ash-based products; and that certain requirements are necessary for the waste used as input in the recovery operation and for the treatment processes and techniques, as well as for fertilising products resulting from the recovery operation, in order to ensure that the use of those fertilising products does not lead to overall adverse environmental or human health impacts.

Since July 2016, the EC and CEN have worked together to elaborate a draft standardization request regarding the fertilizing products in relation to the new regulation and annexes of the European Parliament and of the council laying down rules on the making available on the market of CE marked fertilizing products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009.

UNE joined the Standardization Request ad-hoc Group (SRAHG Fertilisers), composed by:

- BT Members (or their representatives nominated by National Standards Bodies (NSBs, see Annex D)
- Partner organizations represented in the TCs (e.g. ECOS)
- Chair and Secretariat of the following TCs: CEN/TC 223, CEN/TC 260, CEN/TC 444 and CEN/TC 455
- CCMC (Secretariat)

Each Technical Committee concerned with this imminent standardization request had expressed their needs into standards and for each parameter, EC had proposed a method.

The imminent standardization request (under signature process) that will be addressed by the EU to CEN that details the list of new harmonised standards and European standardisation deliverables to be drafted and deadlines for their adoption. The whole TC 455 work programme on plant biostimulants has been designed to this purpose. The other TCs will mainly revise their existing standards to include an annex

with the correspondence with the requirements of the Regulation, for citation in the Official Journal of the European Union.

INCOVER Project is included in the list of R&D projects relevant to nutrient recycling and nutrient management published by the European Sustainable Phosphorus Platform (ESPP), a hub for networking, for exchange of information and for interaction between research and industry.

ACTION PROPOSED
The new Regulation states that 'to ensure legal certainty, take advantage of technical developments, and further stimulate the incentive among producers to make more use of valuable waste streams, the scientific analyses and the setting of recovery requirements at Union level for such products should start immediately after the entry into force of this Regulation'. The outcomes of INCOVER project in the field can contribute as case studies and best practices in support of the development of such requirements.

4.3 Smart irrigation systems

As is the case with many industrial sectors, the irrigation systems are accomplishing a digital transformation based on Internet of Things (IoT). Smart cities and Smart Agriculture are complex challenges that will support sustainable development by unlocking the full potential of data. INCOVER partners requested information on networking and interconnecting off-the-shelf objects (sensors, actuators) into a single web-based platform under a plug-n-play approach, specifically targeted to the controller of smart irrigation or smart agriculture.

The IoT is a crucial infrastructure of smart sustainable communities, as it powers interoperability of heterogeneous systems/ applications making their data accessible and reusable by a potential new universe of cross-domain applications and operators. An effective and interoperable smart city platform is the catalyst that can break the vertical information silos and build a digital foundation in which communication and information sharing between different IoT platforms are possible. The pooling of external data and other historical information not only allows new and innovative sustainability solutions to be developed based on a more comprehensive set of database but also enhances predictive analytics. With a more diverse set of data, cities and communities would be able to improve their adaptative and mitigation strategies, ultimately leading to significant sustainability gains. Standardization of the communication protocols is also key for data transmission.

CEN/TC 334 is responsible for standardization of irrigation systems and equipment by elaboration of performance requirements, characteristics and test methods. It was pioneer in addressing the remote monitoring and control for irrigation systems within CEN/TC 334/WG 9. It took the decision to update EN 15099-1:2007 '*Irrigation techniques - Remote monitoring and control for irrigation systems - Part 1: General considerations',* including definition of both physical interfaces and data interchange for the entire system.

For the reasons of international compatibility, the working group decided to follow as far as possible the ISO communication model. The activity in Europe decreased dramatically and it was decided to work at international level for later adopting he standard at European level.

The initial proposal for producing one standard (ISO 21622 Irrigation techniques -- Remote monitoring and control for irrigation) was accepted and decided to split in the current 4 parts, addressing functionality and interoperability. Therefore the decision taking strategies have moved to ISO (ISO/TC 23/SC 18 'Irrigation and drainage equipment and systems') and other non-European countries are taking the lead, not having achieved yet the expected progress with ISO/CD 21622-3 *Irrigation techniques -- Remote monitoring and control for irrigation -- Part 3: Interoperability*.

ACTION PROPOSED
Smart agriculture is still missing of specific standardization, although it has already been on the agenda of the 2019 IoT Week in Aahrus (IoT Forum, AIOTI), Denmark and other fora. The experience of INCOVER project in this regard could be used to provide advice on best practices.

4.4 Wastewater management in a Smart City

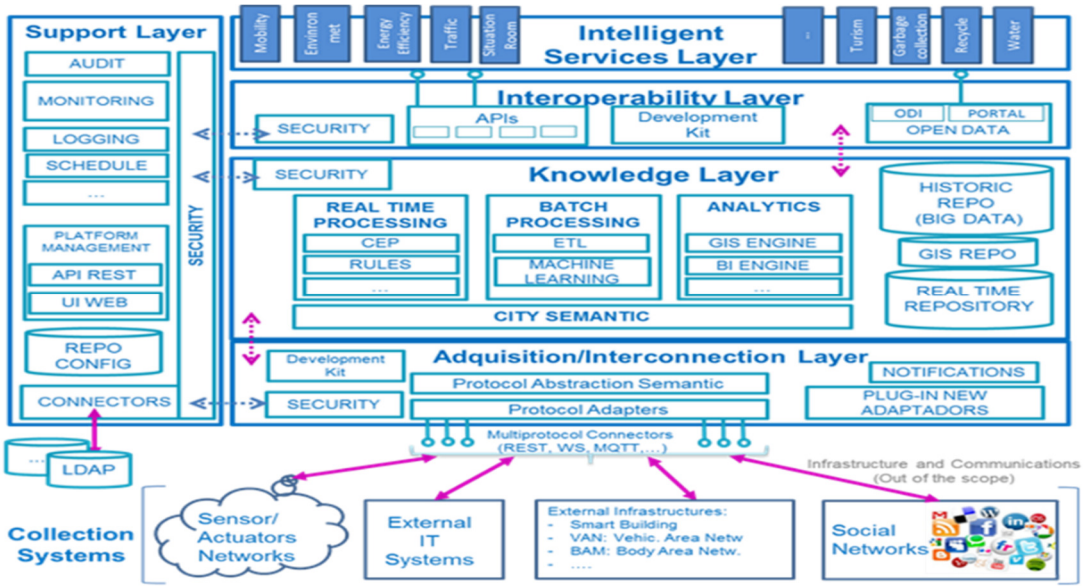
One of the objectives of INCOVER is to develop a decision support system for supporting the selection of sustainable and cost-efficient treatment technologies through life cycle assessment (LCA) for a holistic water management approach.

When considering a smart city, the typical actors are energy consumption, mobility & transport because of the impact on air quality, and the use of technologies. The wastewater management is a fundamental 'vertical' in any city and community, and therefore specific standardization could be developed in support of specific public policies.

Interoperability of Smart City Platforms (SCP) has been addressed by ITU-T Study Group 20 on "Internet of Things and smart cities and communities" from the International Telecommunication Union, which is the United Nations' specialized agency for Information and Communication Technologies, responsible for the development of the only international standards on the subject: UIT- T Y.4201 & Y.4201 (ITU-T Y.4201: High-level requirements and reference framework of smart city platforms).

They advance sustainability and resilient in smart cities by providing the blueprint of an open and interoperable smart city platform that is capable of addressing a wide-range of city challenges including but not limited to urban sensing, infrastructure management, climate change, and citizen-centered integrated services. Such platform is the digital foundation for circulating data collected by different sensor networks and other sources and translating them into actionable insights that support city stakeholders in making better decisions. FIWARE Platform for smart cities (developed in a project funded by the European Union under the programme FP7-ICT) is an example referenced at the Smart City Guidance Package (SCGP) developed within the European Innovation Partnership on Smart cities and Communities (EIP-SCC) and launched in May 2019. Figure 2 shows the layout of a SCP allowing interoperability, where irrigation could be a "vertical" at the northbound and also data from the IoT could enter the platform through the southbound.

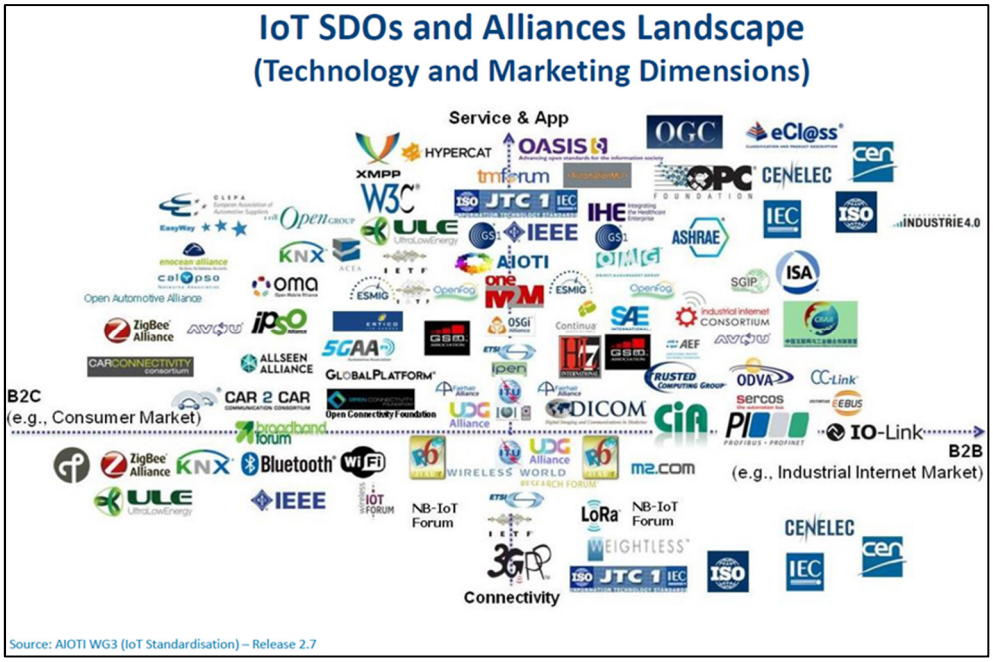
Figure 2. The layout of a smart city platform according to Recommendation UIT- T Y.4201 & Y.4201



Furthermore, it was identified as a significant issue the need to standardise the data semantics to feed the platform and progress is being made, e.g. ETSI produced [ETSI GS CIM 009 V1.1.1 (2019-01)]at the Industry Specification Group (ISG) on Context Information Management (CIM); NGSI-LD API'.

Standardization on IoT and on the communication protocols is being widely developed within diverse standards development organizations (SDOs) such as ETSI, ITU, ISO, IEEE, OASC, etc. Telecontrol protocols are standardized under CENELEC/TC 57 'Power systems management and associated information exchange'. Figure 3 from shows the IoT SDOs and Alliances landscape, giving an idea of the complexity of this issue (source AIOTI WG3 *IoT Standardisation*, release 2.7).

Figure 3. IoT SDOs and Alliances Landscape



In this regard is important to note the agreement reached by the three international standards organizations - ISO, IEC and ITU - to establish in 2019 a Joint Smart Cities Task Force in order to further coordinate standardization efforts.

UNE participated at the ITU-T SG 20 meeting hold in Geneva on 9-18 April 2019 and explored the feasibility of developing specific standards work on irrigation as use case. It is considered that a work item in this regard would be accepted, as there are ongoing works on smart farming (draft Y.IoT-SLF *Framework and capabilities for smart livestock farming based on Internet of things*)

UNE also joined the CEN-CENELEC-ETSI Sector Forum on Smart Sustainable Cities and Communities, is a joint group of the three European Standardisation Organisations (ESOs) that acts as an advisory and coordinating body for European standardization activities related to Smart Sustainable Cities and Communities field. It does not itself develop standardization deliverables. It liaises and coordinates with relevant European initiatives (such as for example the European Innovation Partnership (EIP) on Smart Cities), and also identifies and gives due consideration to European innovation/research projects which might impact the field/subject. At its last meeting hold in 4th June 2019 the Swedish proposal for establishing a new CEN/TC on Smart Cities with capacity to draft European Standards was announced.

ACTION PROPOSED

The waste water management should be a relevant 'vertical' in a smart city. Transversal cooperation among the diverse policy makers is encouraged in order to take advantage of future investments.
The citizen's perception on reutilization of water could also be improved by these coordination efforts.
The experience of INCOVER could be supportive.

4.5 Water management digitalization

The 2019 Rolling Plan for ICT Standardisation of the European Commission remarks the importance to improve integrated water resource protection and management by addressing integrated water and wastewater management, water reuse, circular economy, water system monitoring and reporting, pollution reduction and prevention, smart irrigation, resilience in the field of floods and droughts, leakage reduction and prevention, water governance, and awareness raising of the true value of water by all stakeholders.

Considers essential to develop and implement robust, smart, cost-effective, efficient and tailored water management systems, solutions and multi-sectoral governance models in Europe and globally, and recognizes that despite a promising technological scenario, currently, the water domain is characterized by a low level of maturity concerning the integration and standardization of ICT technology, their business processes and the related implementation in the legislative framework.

Although this could be attributed partly to the fragmentation of the water sector as well as the lack of organizational and financial resources to match priorities and needs, the development of system standards is nevertheless a key enabling factor for smart water solutions that should ensure interoperability of solutions through promoting common meta-data structures, standard protocols and interoperable (open) interfaces instead of proprietary ones.

The European Commission is expected to work towards and define a long-term regulatory strategy about the adoption of smart water technologies.

ACTION PROPOSED
The Rolling Plan for ICT Standardisation of the European Commission is a living document. INCOVER partners can contribute with their views on the need to deploy specific policies for waste water through their NSBs when the next consultation is launched in order to prepare the next Rolling Plan for 2020.

4.6 Circular economy & Opportunity to contribute to SDGs

The Circular Economy action plan of the European Commission seeks, among others, to boost the market for reused water, in order to tackle water scarcity across the EU. The Commission proposed dedicated legislation setting minimum requirements for reused water for agricultural irrigation. In addition, practices on water reuse are integrated into water planning and management or in the review of the relevant Best Available Techniques Reference Documents (BREFs). Unfortunately, the Report on 'Horizon 2020 R&I projects supporting the transition to a Circular Economy' includes only projects Horizon 2020 WP2016-2018, and therefore INCOVER project is not referenced.

However the need for waste water treatment and water reuse is not clearly stated. The scope of CEN/TC 183 'Waste management' is standardization in the field of waste management including public cleaning, taking into particular account technical and logistical aspects. Also drafting of standards for products and procedures as well as safety requirements for the collection, transport, storage and transfer of solid but also for liquid waste. At its last meeting experts agreed that standardisation in support of circular economy is premature and instead they would elaborate a position paper.

ISO has also established recently a new ISO/TC 323 on Circular Economy, but neither it has any of the mentioned items in its scope.

In this context the EC priority is to accelerate the implementation of EU policies and initiatives relating to water and environment while also contributing to policy relating to the Energy Union, climate action and the Digital Single Market in line with the Sustainable Development Goals, particularly SDG 6 'Clean water and sanitation', SDG 11 'Sustainable Cities and Communities', SDG 12 'Responsible consumption and production' and SDG 13 'Climate action', Paris Agreement and United Nation climate conference.

Regarding the Sustainable Development Goals of the United Nations, SDG 6 'Clean water and sanitation' is focused on ensuring access to water and sanitation for all, and includes the following targets:

- 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

- 6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

- 6.B Support and strengthen the participation of local communities in improving water and sanitation management

ACTION PROPOSED
INCOVER approach addresses key cross-cutting and thematic priorities identified in EIP on Water. Better knowledge of the roadmaps of other partnerships and coordination between different EU policies (EIP-SCC, Circular Economy, etc. would enhance current initiatives and provide a holistic approach to the waste water management. It would also help improving social impacts and public acceptance of these technologies to promote water reuse.

4.7 Water reuse & Sludge recovery

ISO/TC 282 'Water reuse' covers standardization of water reuse of any kind and for any purpose. It includes technical, economic, environmental and societal aspects of water reuse, comprising this a sequence of the stages and operations involved in collection, conveyance, processing, storage, distribution, consumption, drainage and other handling of wastewater, and treated effluent, including water that is reused in repeated, cascaded and recycled ways.

Ongoing standardization works cover treated wastewater reuse for irrigation (SC 1), water reuse in urban areas (SC 2), risk and performance evaluation of water reuse systems (SC 3) and industrial water reuse (SC 4), besides works on water systems for biopharma industries (WG3) and terminology (WG 2).

Due to its completeness, ISO/TC 282 was selected as the most relevant TC to collaborate with and to present the INCOVER activity. Annex B describes the collaboration experienced with ISO/TC 282 and includes the slides of the presentation made by UNE on behalf of INCOVER at their last meeting in Lisbon in May 2019, as well as the detail of the meeting minutes with the acknowledgement to the project.

CEN/TC 308 'Characterization and management of sludge' scope includes the drafting of good practice documents in the production, utilization and disposal of sludges. Thus, has published some Technical Reports on Good practice for sludge utilisation, e.g. CEN/TR 13097:2010 Characterization of sludges - Good practice for sludge utilisation in agriculture.

Currently there is no activity and remaining work on process controls methods (CEN/TC 308/WG 1) has been transferred to ISO/TC 275 'Sludge recovery, recycling, treatment and disposal', a TC with a wide scope including standardization of the methods for characterizing, categorizing (with a view to facilitate decisions on the choice of the treatment procedures and of the use and disposal of sludge), preparing, treating, recycling and managing sludge and products from urban wastewater collection systems, wastewater treatment plants for urban and similar industrial waters. It includes all sludge that may have similar environmental and/or health impacts.

Although it still has not published any standard, it is drafting future ISO 19698, providing guidance on the beneficial use of biosolids produced from industrial and municipal wastewater treatment and biosolids derived products (e.g. composts, growing media) in the production of food and feed crops, energy crops, forestry crops and for the remediation of disturbed sites.

ISO/TC 275 also has produced a Strategic position paper on phosphorus recycling from wastewater treatment processes-converted.

Finally, it is also remarkable that it has agreed to develop a new project for a Technical Report on 'Sludge recovery, recycling, treatment and disposal - Guidelines for Risk Communication and Management of Public Perception'.

At its last meeting encouraged NSBs to nominate more technical experts in order to ensure that new work items can be implemented with the necessary technical experts from at least five participating P member countries.

At the next meeting to be held in China in September 2019 there will be a Workshop on sludge treatment.

ACTION PROPOSED

European participation in these ISO/TCs should be a priority for an early identification of standardization gaps for Europe. Guidance documents on good practices could be developed and later promoted to ISO if relevant. INCOVER partners could take advantage on the use of the standards developed by ISO/TC 282 and are invited to engage through their NSBs.

5 Conclusions and recommendations

INCOVER partners can benefit directly as users of the standards in the field already developed and available in the market.

Regrettably because many results of the INCOVER project were produced at the very end of the project period, it was not possible to produce deliverables with specific content that could be released and submitted to the relevant TCs as an innovative input to their standardization works, due to the time constrains to follow the necessary standardization internal procedures. For the same reason, the participation in the development of the existing drafts or proposing new ones had to be discarded. In case that this situation would reverse, for example by giving continuity through a further innovation project, the direct contribution to standardization work could be feasible.

On the other hand INCOVER succeeded in disseminating the project activity to ISO/TC 282/SC 3, and project partners were invited to join through their National Standards Bodies (NSBs). For full details see Annex B.

Concerning this, at the ISO or CEN Technical Committees experts are accredited by the member bodies, NSBs. NSBs contribute with national delegations to the TCs and also accredit national experts in order to join a specific working group for the development of a specific standardization work item. Usually the selection of the national expert is a decision taken by a national TC that is mirror to the relevant TC activity. See the list for CEN members in Annex D.

In addition, the approach made by UNE to the relevant TCs offers a wide summary of possible actions for dissemination activities with technical committees (see full details in clause 4).

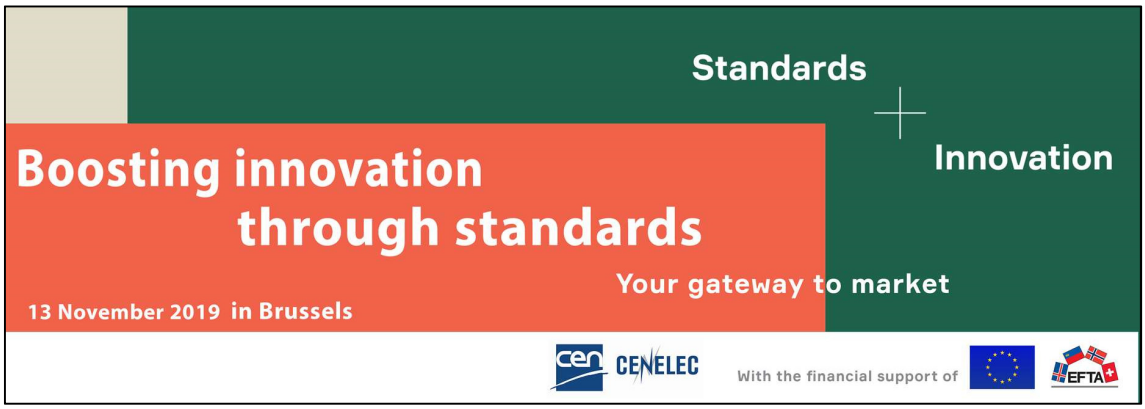
It is considered that INCOVER partners could contribute with their experience through their National Standards Bodies (NSBs) to the topics in Subclause 1.2. A summary is shown in Table 5.1.

Table 5.1. Summary of main recommendations from for future actions related to the interests of INCOVER partners

TOPIC (as per 1.2)	**Recommendations to INCOVER towards future standardization work**
TREATMENT PLANTS DESIGN: Geotextiles	Opportunity to standardise best practices in the selection of materials
FERTILISERS: Phosphorus recycling; New EU Regulation on Fertilisers	INCOVER outcomes in the field can contribute as case studies and best practices in support of the development of recovery requirements.
WASTEWATER TREATMENT: Vocabulary	The relevant INCOVER partners could contribute with their experience to the standardization of the terminology in the field of wastewater engineering; also in sludge recovery
WASTEWATER MANAGEMENT: Smart City Platform	INCOVER partners to promote the vision of wastewater as a key element for a smart city. Help to link different programmes (e.g. EIP-SCC and EIP Water)
SMART IRRIGATION SYSTEMS: IoT & Communication protocols; Smart agriculture	Potential to contribute to the standardisation on best practices on smart irrigation and smart agriculture. Connect data to a Smart City Platform.
WATER REUSE: Technologies	Enhance compatibility and interoperability with already existing solutions. Contribute to the 2020 Rolling Plan for ICT Standardization

As a final and overall recommendation UNE strongly suggests INCOVER partners to foster linkage to the European policies (Contribution to the SDGs and EU policies on Climate change and circular economy, etc.), to improve public acceptance of the INCOVER technologies to promote water reuse.

In this final regard, UNE is committed to the promotion of standardization within research and innovation activities. Dissemination of benefits will be made at a dedicated European Conference 'Boosting innovation through standards' to be held on 13th November 2019 in Brussels.



This European conference is about bringing new products, systems and services to the market by:

- speeding up the adoption of research and innovation outcomes;
- generating trust for innovative ideas;
- driving business scaling across markets.

Leading experts in innovation and standardization will present their experiences in linking the two worlds and highlighting how each one is benefiting from the other.

For further information on the event visit: https://www.eu-ems.com/summary.asp?event_id=4417&page_id=10265

Annex A - Abstract from the Common Patent Policy for ISO/IEC/ITU

In the light of the need to balance the competing interests of standard-essential patent (SEP) holders and standards implementers, and aiming to develop standards that reflect the best available technical solutions, SDOs have established rules (usually referred to as IPR policies or patent policies) governing the inclusion of patents in standards. These IPR policies generally require that patent holders disclose their SEPs during a standard's development and that they make commitments to licensing such SEPs to all standards implementers under reasonable and non-discriminatory conditions.

In a typical standardization process, it is the participants that drive a standard's development by proposing the inclusion of what they deem to be the most appropriate methodologies, technologies or technical solutions. The development of such methodologies, technologies or technical solutions is often a complex, costly endeavour demanding investments in R&D that can span several years. Yet, for a variety of reasons, many companies volunteer their patented innovations for inclusion in standards.

Standards can incorporate literally thousands of patents, and the associated difficulties have been compounded by the fact that the development of standards sometimes anticipates the progression of technology rather than following it.

A standard-essential patent (SEP) is one that is indispensable to the implementation of a standard. A patent is considered standard-essential if the text of a standard is drafted in such a way that it becomes impossible to implement the specifications of the standard without using the technology protected by the patent. While there may be (and usually are) many patent-protected innovations able to add value to standards-based products, these are not necessarily essential as per the above definition.

Most standards bodies have developed IPR policies that allow for companies' patent-protected innovations to be reflected in standards, provided that such intellectual property is made available to all standards implementers under royalty-free or reasonable and non-discriminatory terms and conditions.

The inclusion of patented technology in standards is very common today. One explanation for this is that the inclusion of patented technology adds to standards' ability to improve performance, cost-effectiveness, connectivity or interoperability. Another is that patents have come to cover a larger portion of our society's overall knowledge base. A further, complementary explanation for the increase in SEPs is that they serve the strategic interests of market players, which see considerable benefit to having their patented technologies selected as part of a standard.

Companies owning SEPs benefit from new revenue-generating opportunities in that every implementer of a standard is *by definition* infringing the associated SEPs unless they acquire licences to these SEPs from their owners. SEP owners possess strong bargaining positions in cross-licensing deals that grant them access to other patents. Companies also benefit from contributing patented technology to a standard because the widespread adoption of that standard might signify a change in market direction that suits a SEP owner's strengths and expertise or existing products, platforms and clients, thereby giving them a competitive advantage by virtue of their having less need than their competitors to remodel their product offerings.

Although the patent and standardization systems both aim to support and incentivize innovation and technological progress, the intersection of these two mechanisms may give rise to various tensions and conflicts. The standardization system is based on the assumption of commonalities, creating an even playing field for competition by granting stakeholders equal access to innovative solutions.

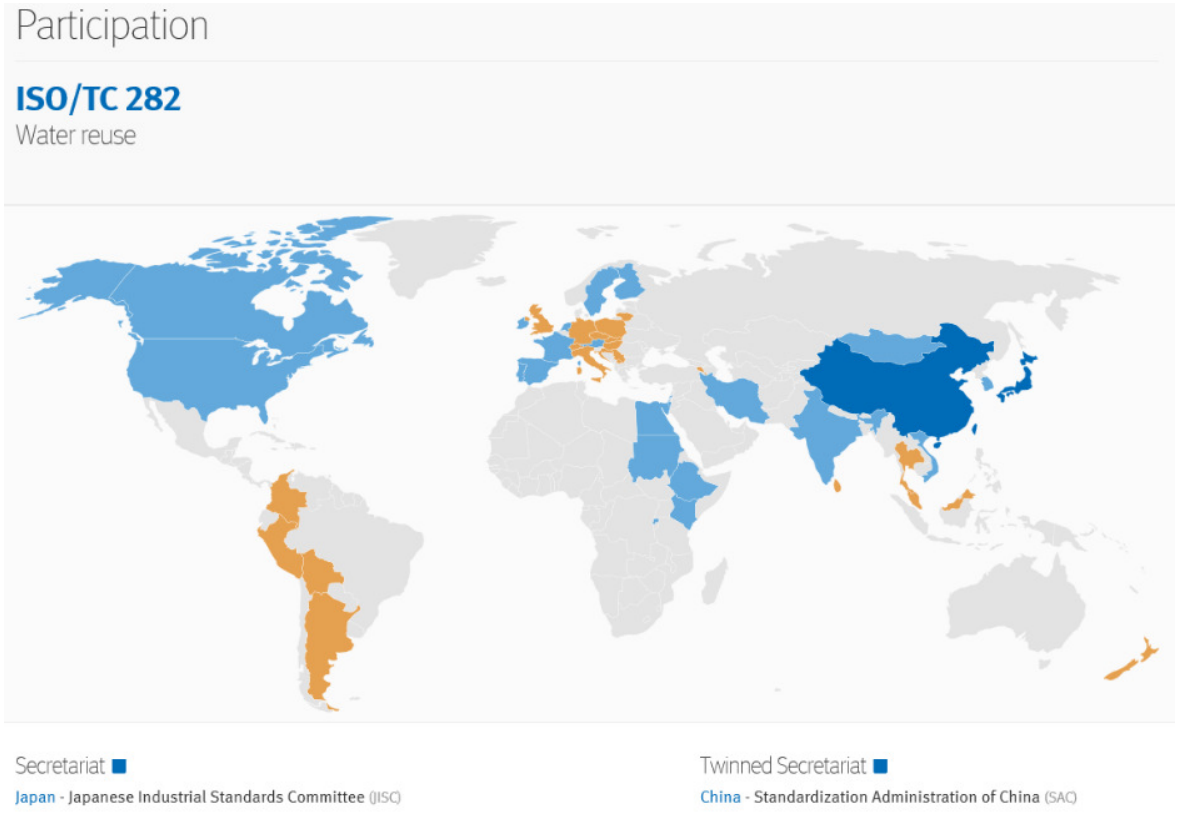
Conversely, the patent system is based on the award of temporary monopolies borne of IPR holders' ability to exclude others from implementing protected technologies. The contrasting principles of the inclusivity of standards and exclusivity of IPR do not meet without complexity.

Annex B – Collaboration with ISO/TC 282 'Water reuse'

B.1 Selection of ISO/TC 282

Due to its completeness UNE approached ISO/TC 282 'Water reuse', an international TCs with good alignment to INCOVER project, with a wide participation of national delegations (24 participating members and 22 observer members) shown in Figure B.1. Details of this TC can be found in Deliverable D4.1.

Figure B.1. Participation in ISO/TC 282



Having contacted its managerial team and introduced the project, UNE was invited to present the objectives and outcomes of the INCOVER research project at the meeting of the ISO/TC 282/SC 3 'Risk and performance evaluation of water reuse systems' taking place in Lisbon (Portugal) on the 20-21st of May 2019.

Accordingly, UNE made a 30 minutes presentation at the meeting on behalf of INCOVER to attendants, 31 international experts from different nationalities (see table B.1), followed by a Q&A interchange time with the audience.

It is important to note that initially UNE also submitted an application request from INCOVER to establish a liaison with them (Liaison D according to ISO Directives) that would allow INCOVER partners a direct access to their drafts and contribution. However, despite the standardization work under development in this TC is deemed quite relevant, the specific innovation provided by INCOVER project was still -at the time of the presentation - far from the broader scope of the standards in their actual work programme. Neither particular contribution was foreseen in the short term due to the close completion of the project and end of funded activity. Therefore, at the end of the meeting UNE finally withdrew the request for establishing a liaison.

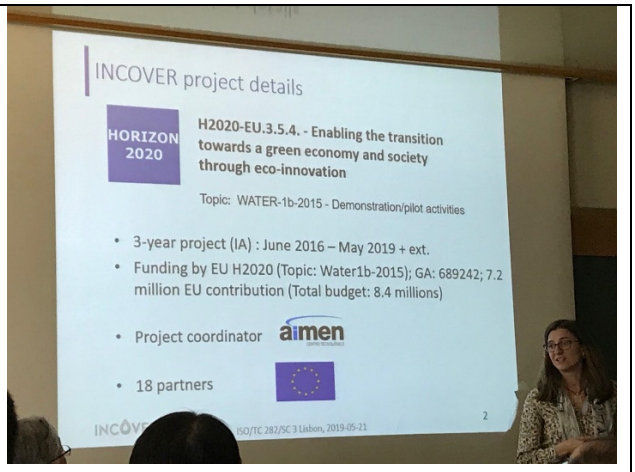
INCOVER partners were invited to contact their National Standardization Bodies for engaging individually.

Table B.1. List of ISO/TC 282/SC 3 members

Participating Members (15)	**Observing Members (7)**
- Austria (ASI) - Canada (SCC) - China (SAC) - France (AFNOR) - India (BIS) - Iran, Islamic Republic of (ISIRI) - Israel (SII) - Japan (JISC) - Secretariat - Kenya (KEBS) - Korea, Republic of (KATS) - Malaysia (DSM) - Portugal (IPQ) - Singapore (SSC) - Spain (UNE) - United Kingdom (BSI)	- Czech Republic (UNMZ) - Finland (SFS) - Germany (DIN) - Hungary (MSZT) - Mongolia (MASM) - Sweden (SIS) - Thailand (TISI)

B.2 Pictures of the INCOVER presentation of INCOVER project to ISO/TC 282/SC 3 10th Meeting

Pictures taken during the presentation made by Ms. Tania MARCOS (UNE) on behalf of INCOVER at the 10th ISO/TC 283/SC 3 meeting on 20-21 May 2019 in Lisbon.



B.3 INCOVER presentation at the ISO/TC 282/SC 3 10th Meeting

INCOVER
Innovative Eco-Technologies for Resource Recovery from Wastewater

Project overview

Tania MARCOS, Spanish Association for Standardization , UNE

Presentation to ISO/TC 282/SC 3
Lisbon, 2019-05-21

INCOVER project details

HORIZON 2020

H2020-EU.3.5.4. - Enabling the transition towards a green economy and society through eco-innovation

Topic: WATER-1b-2015 - Demonstration/pilot activities

- 3-year project (IA) : June 2016 – May 2019 + ext.
- Funding by EU H2020 (Topic: Water1b-2015); GA: 689242; 7.2 million EU contribution (Total budget: 8.4 millions)
- Project coordinator aimen
- 18 partners

INCOVER Consortium

aimen, iBET, aqualia, AARHUS UNIVERSITET, HELMHOLTZ CENTRE FOR ENVIRONMENTAL RESEARCH – UFZ, isle, UPC, SolarSpring, simbiente, Universidad de Valladolid, DANISH TECHNOLOGICAL INSTITUTE, AUTARCON, Center for Recirculating, RENERGIE SYSTEME, biotrend, Office International de l'Eau, ICLEI Local Governments for Sustainability

INCOVER Concept

The challenges:

- Main pressures on water resources: climate change, pollution, urbanisation, water scarcity
- Expensive cost of operation and maintenance of wastewater treatment

The solution:

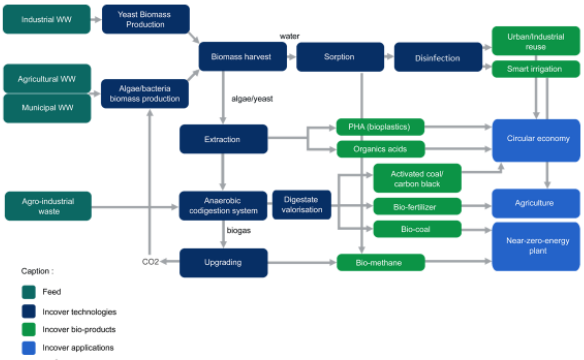
Transform wastewater **from a waste stream into a source of new added-value products**

INCOVER Objectives

Main objective: To reduce the overall Operation and Maintenance (O&M) costs of conventional wastewater treatment by 50% and alleviate water scarcity.

- **Validate innovative technologies** at demonstration scale to obtain bio-products
- Develop **innovative monitoring techniques**
- Assess their **cost-effectiveness** and **sustainability**
- Develop a tailored **Decision Support System (DSS)** for a holistic wastewater management approach
- Develop strategies to facilitate **rapid market access**

INCOVER processes

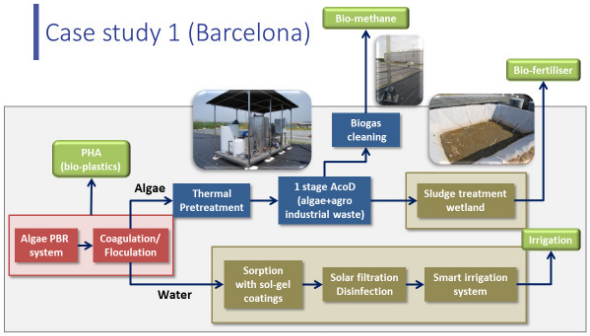


Case studies

Municipal Agricultural wastewater	Municipal wastewater	Industrial wastewater
		
At Universitat Politecnica de Catalunya (Spain)	At Chiclana and Almeria AQUALIA facilities (Spain)	At Helmholtz – Centre for environmental research (Germany)

- ✓ **Innovative monitoring techniques via optical sensing monitoring**
- ✓ **Tailored Decision Support System for selecting the most technical, social and cost effective solutions**

Case study 1 (Barcelona)



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Case study 1: PBRs

INCOVER ISO/TC 282/SC 3 Lisbon, 2019-05-21 9

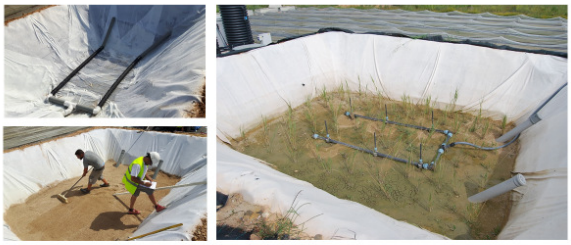
Case study 1: PBRs

INCOVER 10

Case study 1: Anaerobic co-Digestion Unit

INCOVER ISO/TC 282/SC 3 Lisbon, 2019-05-21 11

Case study 1: Sludge treatment wetland construction



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Case study 1: Absorption columns construction

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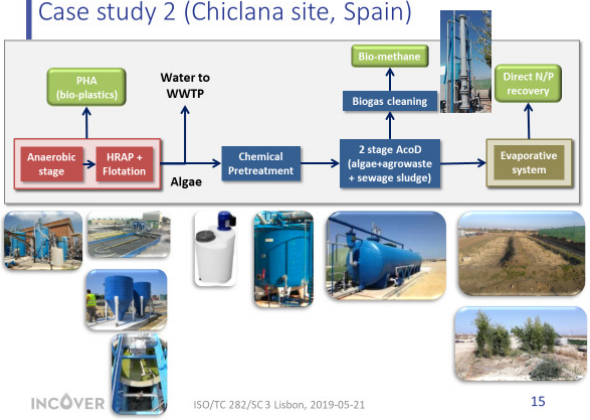
Case study 1: Solar disinfection system

INCOVER ISO/TC 282/SC 3 Lisbon, 2019-05-21 14

Case study 2 (Chiclana site, Spain)



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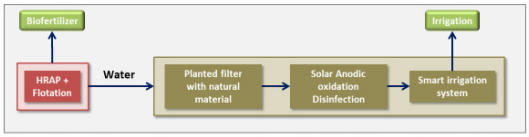
Case study 2 (Almería site, Spain)



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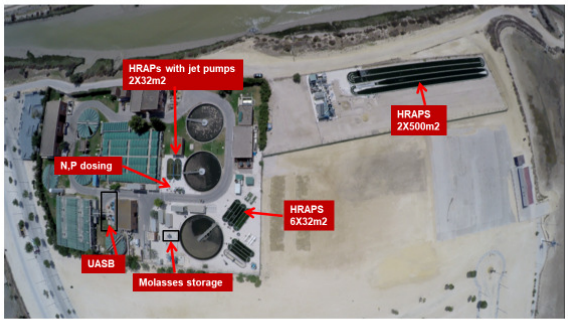
Case study 2: PHA production at Chiclana STP



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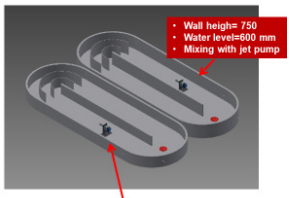
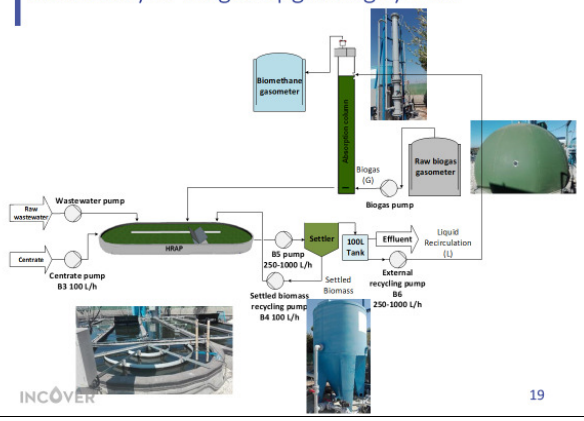
Case study 2: Implementation of PHA processes



Wall heigh= 600
Water level =550
Mixing with jet pump

INCOVER ISO/TC 282/SC 3 Lisbon, 2019-05-21 18

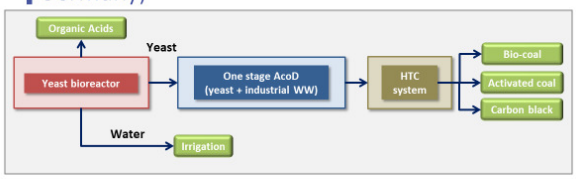
Case study 2: Biogas upgrading system



INCOVER 19

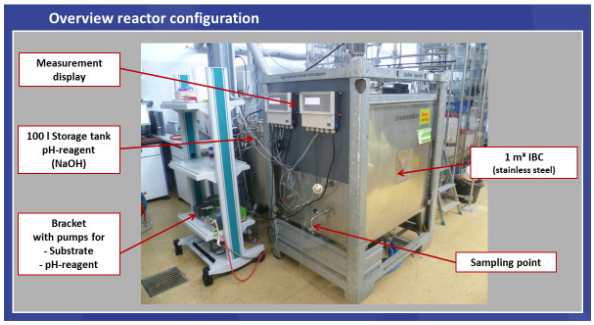
Case study 2: Evaporative system for nutrient recovery

Case study 3 (Leipzig/Bad Königshofen, Germany)



INCOVER ISO/TC 282/SC 3 Lisbon, 2019-05-21 21

Case study 3: Yeast process at 1 m³ reactor



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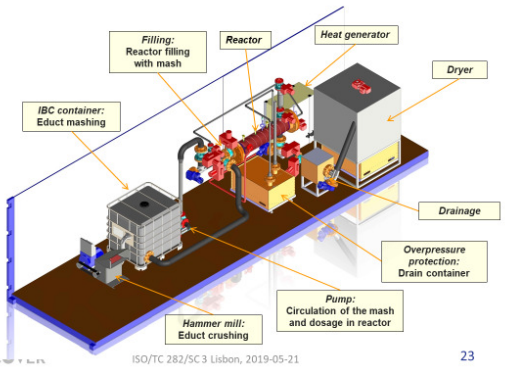
Case study 3: Construction of HTC plant



INCOVER ISO/TC 282/SC 3 Lisbon, 2019-05-21 23

INCOVER main technologies

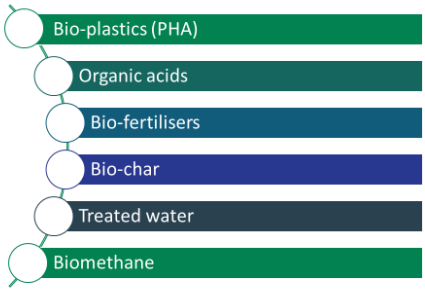
- PHA production
  - PhotoBioReactor system (PBR)
  - High Rate Algae Pond (HRAP)
- Organic acid production
- Physical and thermal pre treatment
- Anaerobic codigestion process
- Integral biogas upgrading

INCOVER ISO/TC 282/SC 3 Lisbon, 2019-05-21 24

INCOVER main technologies

- Nutrient recovery :
  - Adsorption columns
  - Planted filters
- Solar-driven disinfection :
  - Anodic oxidation
  - Ultrafiltration
- Smart irrigation system
- Anaerobic digestate valorisation:
  - Sludge treatment wetlands
  - Evaporative systems
  - HTC process
- Optical sensing and monitoring

INCOVER main bio-products



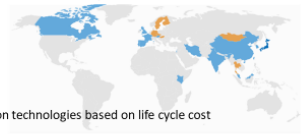
INCOVER main results

- **0.67 kgPHA/d from phototrophic bacteria/microalgae systems**
- **Set up of optical sensing monitoring device for measuring PHA and the chemical/organic compounds**
- **8 m^3 biomethane/d through an innovative biogas cleaning technology removing CO_2, H_2S, NH_3 and VOCs from biogas**
- **22 kg organic acids/d from the yeast bioreactor treating oil waste**
- **10 m^3/d of pathogen free water by solar-driven power anodic oxidation and ultra-filtration systems**

Consideration of ISO/TC 282 *Water reuse*/SC 3 work

SC 3 *Risk and performance evaluation of water reuse systems*

- **Published ISO standards**
  - **ISO 20426:2018** Guidelines for health risk assessment and management for non-potable water reuse
  - **ISO 20469:2018** Guidelines for water quality grade classification for water reuse
  - **ISO 20468-1:2018** Guidelines for performance evaluation of treatment technologies for water reuse systems -- Part 1: General
- **Under development**
  - Part 2: Methodology to evaluate performance of treatment systems on the basis of greenhouse gas emissions
  - Part 3: Ozone treatment technology
  - Part 4: UV Disinfection
  - Part 5: Membrane filtration
  - Part 6: Ion exchange technology
  - Part 7: Advanced Oxidation Processes
  - Part 8: Evaluation of wastewater reclamation technologies based on life cycle cost



B.4 ISO/TC 282/SC 3 10th Meeting resolutions

7. **Items for future work**

There was no future work proposed at the meeting.

8. **Requirements concerning a subsequent meeting**

SC 3 Secretary informed that the next meeting (11th meeting) will be held in Tel Aviv (Israel) during November18-22, 2019. Members noted the requested meeting duration to be one day.

Resolution 08/2019 (Lisbon) ISO/TC 282/SC 3 resolves to hold the 11th meeting of ISO/TC 282/SC 3 in Tel Aviv (Israel) during November 18-22, 2019.

9. **Any other business**

Ms. Tania Marcos Paramio from UNE made a presentation on EU-funded project INCOVER.

Resolution 09/2019 (Lisbon) ISO/TC 282/SC 3 resolves to thank Ms. Tania Marcos Paramio from UNE for her informative presentation on INCOVER project.

10. **Approval of resolutions**

Draft resolutions were discussed and finalized with the participants present. See ISO/TC 282/SC 3 N215 for the list of resolutions.

11. **Closure of the meeting (May 21, 17:00)**

SC 3 Chair closed the meeting, thanking all participants and WG 2 convenor for their excellent contribution.

Annex C - List of secretaries and chairs of relevant technical bodies approached

Table C.1. List of secretaries and chairs of relevant technical committees

Reference	Technical body title	Technical Secretariat	Secretary	Chairperson
CEN/TC 165	Wastewater engineering	DIN	Mr Andreas Paetz	Dipl.-Ing. Werner Kristeller
CEN/TC 183	Waste management	DIN	Mr Jan Philip Everding	Mr Frank Diedrich
CEN/TC 223	Soil improvers and growing media	NEN	Mrs Gillian Herpers	M. Laurent Largant
CEN/TC 260	Fertilizers and liming materials	DIN	Mrs Birgit Zöllner	Dr Dietrich Pradt
CEN/TC 308	Characterization and management of sludge	AFNOR	Mrs Aurélie Thiébaud	Mr Christophe Bonnin
CEN/TC 455	Biostimulants	AFNOR	Ms Stephanie Tiprez	M. Benoît Planques
CEN/TC 334	Irrigation techniques	UNE	Mr Francisco Luis Arribas	Mr Enrique Playán
CEN/TC 334/WG 9	Remote Monitoring and Control for irrigation systems	UNE	Convenor	Ms Cristina Madurga
CEN-CENELEC-ETSI SF-SSCC	Smart and Sustainable Cities and Communities	AFNOR	Mrs Mélanie Raimbault	Mr Bernard Gindroz
ISO/TC 282	Water reuse	JISC (Japan)	Ms Yukiko Mizuno	Mr Naty Barak
ISO/TC 282/SC 1	Treated wastewater reuse for irrigation	SII (Israel)	Mr Yaron Ben-Ari	Dr Jorge Tarchitzky
ISO/TC 282/SC 2	Water reuse in urban areas	SAC (China)	Ms Xia ZHU	Dr Hongying HU

Reference	Technical body title	Technical Secretariat	Secretary	Chairperson
ISO/TC 282/SC 3	Risk and performance evaluation of water reuse systems	JISC (Japan)	Ms Yukiko Mizuno	Dr. (Mr.) Naoyuki Funamizu
ISO/TC 282/SC 4	Industrial water reuse	SAC/SII (China/Israel)	Dr Lin Ye / Mr Yaron Ben-Ari	Mr Hongqiang Ren
ISO/TC 275	Sludge recovery, recycling, treatment and disposal'	AFNOR	M Arnaud Gaudrier	vacant
ETSI-ISG Context Information Management (CIM)	Industry Specification Group (ISG) cross cutting Context Information Management (CIM)	ETSI	Convenor	Dr Linsday Frost
ITU-T SG 20	Internet of Things (IoT) and smart cities and communities (SCC)	ITU	Ms Cristina Bueti (Counsellor)	Mr Nasser Saleh Al Marzouqi

Annex D– List of National Standards Bodies - CEN members

Acronym	Country	Organization	Website
ASI	Austria	Austrian Standards International - Standardization and Innovation	www.austrian-standards.at
NBN	Belgium	Bureau de Normalisation/Bureau voor Normalisatie	www.nbn.be
BDS	Bulgaria	Bulgarian Institute for Standardization	www.bds-bg.org
HZN	Croatia	Croatian Standards Institute	www.hzn.hr
CYS	Cyprus	Cyprus Organization for Standardisation	www.cys.org.cy
UNMZ	Czech Republic	Czech Office for Standards, Metrology and Testing	www.unmz.cz
DS	Denmark	Dansk Standard	www.ds.dk
EVS	Estonia	Estonian Centre for Standardisation	www.evs.ee
SFS	Finland	Suomen Standardisoimisliitto r.y.	www.sfs.fi
AFNOR	France	Association Française de Normalisation	www.afnor.org
DIN	Germany	Deutsches Institut für Normung	www.din.de
NQIS/ELOT	Greece	National Quality Infrastructure System	www.elot.gr
MSZT	Hungary	Hungarian Standards Institution	www.mszt.hu
IST	Iceland	Icelandic Standards	www.stadlar.is
NSAI	Ireland	National Standards Authority of Ireland	www.nsai.ie
UNI	Italy	Ente Nazionale Italiano di Unificazione	www.uni.com
LVS	Latvia	Latvian Standard Ltd.	www.lvs.lv

Acronym	Country	Organization	Website
LST	Lithuania	Lithuanian Standards Board	www.lsd.lt
ILNAS	Luxembourg	Organisme Luxembourgeois de Normalisation	www.portail-qualite.lu
MCCAA	Malta	The Malta Competition and Consumer Affairs Authority	https://mccaa.org.mt
NEN	Netherlands	Nederlands Normalisatie-instituut	www.nen.nl
SN	Norway	Standards Norway	www.standard.no
PKN	Poland	Polish Committee for Standardization	www.pkn.pl
IPQ	Portugal	Instituto Português da Qualidade	www.ipq.pt
ISRSM	Republic of North Macedonia	Standardization Institute of the Republic of North Macedonia	www.isrm.gov.mk
ASRO	Romania	Romanian Standards Association	www.asro.ro
ISS	Serbia	Institute for Standardization of Serbia	www.iss.rs
UNMS SR	Slovakia	Slovak Office of Standards Metrology and Testing	www.unms.sk
SIST	Slovenia	Slovenian Institute for Standardization	www.sist.si
UNE	Spain	Asociación Española de Normalización	www.une.org
SIS	Sweden	Swedish Institute for Standards - SIS	www.sis.se
SNV	Switzerland	Schweizerische Normen-Vereinigung	www.snv.ch
TSE	Turkey	Turkish Standards Institution	www.tse.org.tr
BSI	United Kingdom	British Standards Institution	www.bsigroup.com

Annex E - Acronyms

AIOTI – Alliance for the Internet of Things Innovation

CCMC – CEN-CENELEC Management Center

CEN - European Committee for Standardization

CENELEC - European Committee for Standardization in the Electrical field

DSS - Decision Support System

EIP – European Innovation Partnership

EN - European Standard

ETSI - European Telecommunications Standards Institute

IEC - International Electrotechnical Commission

ISO - International Organization for Standardization

ITU – International Telecommunications UNION

NSB – National Standards Body

OASC – Open and Agile Smart Cities

SCP – Smart City Platform

SDO – Standards Development Organizations

SEP –Standard-Essential Patent

SF-SSCC – Sector Forum on Smart Sustainable Cities and Communities

SG – Study Group

TC – Technical Committee

UNE – Spanish Standards Association

References

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- EIP-Water: http://ec.europa.eu/environment/water/innovationpartnership/
  and https://www.eip-water.eu/about

- EIP-SCC: https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en
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  https://ec.europa.eu/research/environment/pdf/h2020_projects_circular_economy_2016-2018.pdf

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- Sustainable Development Goals, United Nations, SDG 6.
  https://www.un.org/sustainabledevelopment/water-and-sanitation/

UNE: www.une.org

CEN: www.cen.eu

CENELEC: www.cenelec.eu

ETSI: www.etsi.org

ISO: www.iso.org

IEC: www.iec.ch

ITU: www.itu.int