| **H2020 – SPIRE-06-2015** |  |
|---------------------------|  |
| Energy and resources management systems for improved efficiency in the process industries |  |

**Title:** Secure Management Platform for Shared Process Resources  
**Acronym:** SHAREBOX  
**Grant Agreement No:** 680843

<table>
<thead>
<tr>
<th>Deliverable 7.9</th>
<th>CEN Workshop Agreement for industrial symbiosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated WP</td>
<td>WP7 <em>Innovation Impacts</em></td>
</tr>
<tr>
<td>Associated Tasks</td>
<td>Task 7.6 Standards setting</td>
</tr>
<tr>
<td>Due Date</td>
<td>M48</td>
</tr>
<tr>
<td>Date Delivered</td>
<td>M45</td>
</tr>
<tr>
<td>Prepared by (Lead Partner)</td>
<td>International Synergies Limited</td>
</tr>
<tr>
<td>Partners involved</td>
<td>ISL, AICE- ITC, DECHEMA, IRIS, CCB</td>
</tr>
<tr>
<td>Authors</td>
<td>Rachel Lombardi (International Synergies Limited)</td>
</tr>
<tr>
<td>Dissemination Level</td>
<td>Public (P)</td>
</tr>
</tbody>
</table>
The information and views set out in this publication are those of the author(s) and do not necessarily reflect the official opinion of the European Communities. Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the information contained therein.
Table of Contents

Publishable Executive Summary .................................................................................................................. 4
1. Introduction ........................................................................................................................................ 5
Appendix 1 CWA on Industrial symbiosis ............................................................................................... 9
Appendix 2 CWA Secretariat contract with SIST ................................................................................. 10
Publishable Executive Summary

The 2018 Amendment to the Waste Framework Directive (2008/98/EC) passed into law calls for member states to promote sustainable use of resources and industrial symbiosis. As industrial symbiosis finds its way into the policies, reports and recommendations of the European Commission across multiple DGs and various member states at the national, regional and local scale, the variety of terminologies and methodologies used in these documents can be confusing and sometimes misleading. Such confusion dilutes the power of the approach to deliver resource efficiency, greenhouse gas reduction and economic benefits.

To support the effective adoption of industrial symbiosis by the public and private sector, and to advance toward mainstream use, reaching and documenting a consensus on best practice methodologies supporting industrial symbiosis implementation across Europe and beyond is considered an important enabling step.

This CEN Workshop is supported by the Horizon 2020-SP TRE projects SHAREBOX and EPOS, and the Interreg Europe projects TRIS and SYMBI, intended to help organisations, governments and individuals consider and implement industrial symbiosis. The CWA provides a consensus on the core elements of industrial symbiosis to enable its identification, drivers for industrial symbiosis, and on good practice approaches to industrial symbiosis implementation across Europe and beyond. These common elements and approaches can form the basis for policy, recommendations and widespread implementation.

Industrial symbiosis is the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of keeping resources in productive use for longer. Core elements of industrial symbiosis are the aspects that enable its identification. Elements considered core to industrial symbiosis are:

- Returning underutilised resources (often called waste) to productive use;
- Information about opportunities (e.g., data on other organisations’ resources, or new technologies) is required to be able to advance a synergy; and
- Business conditions incentivising industrial symbiosis, which may be through market conditions or through policies and regulations.
1. Introduction

In this task the opportunity to advance the industrial symbiosis market through standardisation was addressed. This included the following activities, delivered by ISL:

- Assess interest in European standardisation activity for industrial symbiosis with CEN CENELEC (existing activity, interest and relevance, etc.)
  
  Multiple meetings with CEN starting in November 2017, interest was established for collaboration on a CEN Workshop Agreement (CWA) to define industrial symbiosis, based on the prevalence of the term in Commission reports policies and recommendation, but the lack of a standard definition. The CWA was determined to be a suitable route to pursue as industrial symbiosis did not fall under a specific Technical Committee, and the CWA process itself was designed to be compatible with research projects such as H2020.

- Prioritize the standardisation needs, taking into account potential users (government/policy, companies, expert facilitators-consultants, other).

To support the effective adoption of industrial symbiosis by the public and private sector, and to advance toward mainstream use, it is intended that a pre-standard on Industrial Symbiosis is developed by CEN (European Committee of Standards) Workshop Agreement (CWA) as this pre standard will provide a consensus on best practice methodologies supporting industrial symbiosis implementation across Europe and beyond. The target audience was agreed to include multiple potential users, as listed above, and efforts were made to engage all of them, including partnering with additional H2020 funded project EPOS and 2 Interreg funded projects on industrial symbiosis TRIS and SYMBI.

- Identify a member state to champion standards activity with CEN CENELEC, e.g. by hosting a CEN Workshop Agreement, bringing it to the attention of a standardisation body.

SYMBI partner the Slovenian Government Office for Development and European Cohesion Policy introduced ISL to the Slovenian Standardisation Institute SIST, and an agreement was reached for their secretariat services as required by CEN, after initial explorations with British Standards Institute (BSI) whose representative continued to engage in the process.

- Engage with the relevant standardisation bodies to propose, launch and drive forward a Workshop Agreement for industrial symbiosis.

As above.

- Prepare project plan, liaising with CEN and national member as Secretariat

Project plan agreed with timetable to delivery, and contract signed in December 2017 (Appendix 2)

- Motivate widespread company engagement in the CWA process, with special attention to SPIRE industry participation.
Through EU Interreg SYMBI and Horizon 2020 projects SHAREBOX & EPOS (Enhanced energy and resource Efficiency and Performance in process industry Operations via onsite and cross-sectorial Symbiosis), this activity reaches public and private sector stakeholders in 12 European member states plus Switzerland and Turkey. CWA delegates were largely industry representatives including (full list in the official document):

- **Private sector & Industry reps**
  - ISL, INEOS, ACCIONA CONSTRUCTION, BTC COMPANY, EVONIK INDUSTRIES, GORENJE SUROVINA, ISCO, DECHEMA, CEMBUREAU, CEPI
- **Public sector & Government**
  - MOTIVA (FINLAND), MINISTRY OF DEVELOPMENT (TURKEY), ENEA (ITALY)
- **Academia**
  - U.GHENT, U. SUSSEX, U.CANTABRIA, AIDIMME TECHNOLOGICAL INSTITUTE
- **Institutes/Institutions**
  - BSI, UNE, EIT RAW MATERIALS
- **Individuals**

As a recognized world expert in delivering industrial symbiosis, ISL led the standardization process by preparing a project plan proposal, and draft protocols for a CEN Workshop Agreement (CWA), producing a pre-standard available for adoption by interested parties. The CWA is open access in alignment with H2020 requirements. The output of this task is a CEN Workshop Agreement for industrial symbiosis (D7.9).

Open access assured via the contract paying a fee to ensure open access. The CWA is downloadable from the CEN website for free, but this does not preclude CEN Members (national standards bodies) selling the document.

---

**SIST announcement**

**European industrial symbiosis workshop agreement (CWA)**

On February 21, 2018, a kick–off meeting was held in Brussels to launch the **CEN Workshop on Industrial Symbiosis**. The event marked the start of standardization activities on industrial symbiosis, the aim of which is to **develop a deliverable**, a CEN **Workshop Agreement (CWA)**, which documents a consensus on best practice methodologies supporting industrial symbiosis implementation across Europe and beyond. The workshop gathered **44 representatives from** industry, public sector and research organizations from 10 members states, Switzerland and Turkey.

**Industrial symbiosis will shape future policies**, reports and recommendations of the European Commission and will have large impact on economy, businesses and the environment across Europe and beyond.

The aim of this Workshop is to support the effective adoption of industrial symbiosis by the public and private sector, and to advance toward mainstream use.

**You can contribute your experience** to shape the CEN workshop agreement (CWA) going forward by registering for participation in the CEN process (»Registration form«).

**The secretariat** of this CEN Workshop is held by the Slovenian Institute for Standardization (SIST), and supported by the Horizon 2020-SPIRE projects SHAREBOX and EPOS, and the
For further information please email cwa@sist.si or follow official announcements at https://www.cen.eu/News/Workshops/Pages/WS-2018-001.aspx.

SIST news item

Osnovni elementi in izvedbeni pristopi uvajanja industrijske simbioze

V okviru industrijske simbioze, ki je prepoznana kot eden od gradnikov prehoda v krožno gospodarstvo, se podjetja povezujejo na področju surovin, logističnih in skladiščnih kapacitet, človeških virov, informacijske tehnologije in rabe energije. Zaradi učinkovitejše rabe virov se pri podjetjih, ki sodelujejo v industrijski simbiozi, ustvarijo prihranki, kar prispeva k boljši konkurenčnosti podjetij na eni strani in zmanjševanju pritiskov na okolje na drugi.

S pripravo dokumenta CWA so želeli člani skupine poenotiti uporabo pojma industrijska simbioza med vsemi deležniki (javnimi, zasebnimi, tretjim sektorjem in skupnostmi) s ciljem vključevanja in uvajanja že prepoznanih primerov dobrih praks. Dokument služi zainteresiranim deležnikom, ki razmišljajo o uporabi in izvajanju industrijske simbioze. V dokumentu so predstavljeni ključni izrazi in definicije, ki dajejo osnovno razumevanje koncepta industrijske simbioze. V posebnih razdelkih so opisani ključni elementi, ki omogočajo njeno identifikacijo in spodbujajo njeno uporabo kot gradnika prehoda v krožno gospodarstvo. Predstavljeni so tudi štirje zanimivi pristopi njenega uvajanja in dejavniki za prenos dobrih praks.

Pobuda za pripravo dokumenta prihaja s strani deležnikov projektov SHAREBOX in EPOS, ki sta podprta v okviru programa Obzorje 2020, in deležnikov Interreg Europe projektov TRIS in SYMBI. Vsi štirje projekti so namenjeni spodbujanju uvajanja industrijske simbioze v Evropi in širše.

Evropski dokument CWA 17354:2018 je v angleškem jeziku prosto dostopen na povezavi: https://www.cencenelec.eu/research/CWA/Pages/default.aspx

Google translation:

Basic elements and implementation approaches for introducing industrial symbiosis
From January 2018 to February 2019, the Slovenian Institute for Standardization (SIST), in cooperation with the European Committee for Standardization (CEN), led the Secretariat of the European Working Group Industrial Symbiosis (CEN / WS 093), which took care of the process of drafting a European document entitled Industrial Symbiosis: Basic Elements and
Implementation Approaches (CWA 17354: 2018). There were 30 experts from Slovenia, Switzerland, Germany, Finland, France, Belgium, Spain, the United Kingdom, Turkey and Italy in the CEN compilation group that was published in December 2018.

Within the framework of industrial symbiosis, which is recognized as one of the cornerstones of the transition to the circular economy, the companies connect in the field of raw materials, logistics and storage capacities, human resources, information technology and energy use. For the sake of more efficient use of resources, companies involved in the industrial symbiosis create savings, which contributes to a better competitiveness of companies on the one hand and the reduction of environmental pressures on the other.

By preparing the CWA document, members of the group wanted to unify the use of the concept of industrial symbiosis among all stakeholders (public, private, third sector and communities) with the aim of integrating and introducing already recognized examples of good practices. The document serves interested stakeholders who are considering the use and implementation of industrial symbiosis.

The paper presents key terms and definitions that provide a basis for unifying the understanding of the concept of industrial symbiosis. The specific sections describe the key elements that enable it to be identified and encourage its use as a gateway to the circular economy. Four interesting approaches to its introduction and factors for the transfer of good practices are presented.

The document preparation initiative comes from stakeholders of SHAREBOX and EPOS projects supported under the Horizon 2020 program and stakeholders of Interreg Europe projects TRIS and SYMBI. All four projects are designed to promote the introduction of industrial symbiosis in Europe and beyond.

The European Document CWA 17354: 2018 is freely available in English on the link: https://www.cencenelec.eu/research/CWA/Pages/default.aspx
Appendix 1 CWA on Industrial symbiosis
CEN

WORKSHOP

AGREEMENT

December 2018

ICS 13.020.20

English version

Industrial Symbiosis: Core Elements and Implementation Approaches

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

The formal process followed by the Workshop in the development of this Workshop Agreement has been endorsed by the National Members of CEN but neither the National Members of CEN nor the CEN-CENELEC Management Centre can be held accountable for the technical content of this CEN Workshop Agreement or possible conflicts with standards or legislation.

This CEN Workshop Agreement can in no way be held as being an official standard developed by CEN and its Members.

This CEN Workshop Agreement is publicly available as a reference document from the CEN Members National Standard Bodies.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

© 2018 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>European foreword</td>
<td>3</td>
</tr>
<tr>
<td>Overview</td>
<td>5</td>
</tr>
<tr>
<td>1 Scope</td>
<td>7</td>
</tr>
<tr>
<td>2 Normative references</td>
<td>7</td>
</tr>
<tr>
<td>3 Terms, definitions and abbreviation</td>
<td>9</td>
</tr>
<tr>
<td>3.1 Terms and definitions</td>
<td>9</td>
</tr>
<tr>
<td>3.2 Abbreviations</td>
<td>12</td>
</tr>
<tr>
<td>4 Core Elements of Industrial Symbiosis</td>
<td>13</td>
</tr>
<tr>
<td>5 Drivers for Industrial Symbiosis</td>
<td>13</td>
</tr>
<tr>
<td>6 Approaches to Industrial Symbiosis NOTE</td>
<td>15</td>
</tr>
<tr>
<td>7 Industrial Symbiosis Implementation: Good Practice</td>
<td>18</td>
</tr>
<tr>
<td>7.1 Factors Enabling Good Practice</td>
<td>18</td>
</tr>
<tr>
<td>7.2 Actions Representing Good Practice</td>
<td>19</td>
</tr>
<tr>
<td>Bibliography</td>
<td>20</td>
</tr>
</tbody>
</table>
European foreword

This Workshop has been proposed by 4 European projects working to advance the uptake of industrial symbiosis across Europe and globally. Contribution to standardization activities has been specified as one of the means for dissemination for the projects SHAREBOX (Secure Platform for the Flexible Management of Shared Process Resources) and EPOS (Enhanced energy and resource efficiency and Performance in process industry Operations via onsite and cross-sectorial Symbiosis) of the European Commission’s Horizon 2020 programme, SPIRE Sustainable Process Industries PPP. Advancing policy to stimulate industrial symbiosis is an objective of Interreg Europe projects TRIS (Transition Regions towards Industrial Symbiosis) and SYMBI (Industrial Symbiosis for a Resource Efficient Economy).

CWA Industrial Symbiosis was developed in accordance with CEN-CENELEC Guide 29 “CEN-CENELEC Workshop Agreements – The way to rapid agreement” and with the relevant provisions of CEN/CENELEC Internal Regulations – Part 2. It was agreed on 2018-10-22 in a Workshop by representatives of interested parties, approved and supported by CEN following a public call for participation made on 2018-01-24. It does not necessarily reflect the views of all stakeholders that might have an interest in its subject matter.

The final text of CWA Industrial Symbiosis was submitted to CEN for publication on 2018-11-12. It was developed and approved by:

- International Synergies Limited
- INEOS Group AG
- University of Ghent
- CEPI - Confederation of European Paper Industries
- CEMBUREAU - the European Cement association
- Motiva
- University of Sussex
- EIT RawMaterials
- University of Cantabria
- Ministry of Development, Turkey
- Industrial Symbiosis Limited
- ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development
- Gorenje Surovina
- BTC Company
- Evonik Industries
- DECHEMA - Expert network for chemical engineering and biotechnology
- BSI Group
- ACCIONA Construcción
- UNE
- AIDIMME - Technological Institute
- Dr. Teresa Domenech, consultant
- Giovanni Impoco, consultant

It is possible that some elements of the CWA Industrial Symbiosis may be subject to patent rights. The CEN-CENELEC policy on patent rights is set out in CEN-CENELEC Guide 8 “Guidelines for Implementation of the Common IPR Policy on Patents (and other statutory intellectual property rights based on inventions)”. CEN shall not be held responsible for identifying any or all such patent rights.
The Workshop participants have made every effort to ensure the reliability and accuracy of the technical and non-technical content of the CWA Industrial Symbiosis, but this does not guarantee, either explicitly or implicitly, its correctness. Users of the CWA Industrial Symbiosis should be aware that neither the Workshop participants, nor CEN can be held liable for damages or losses of any kind whatsoever which may arise from its application. Users of CWA Industrial Symbiosis do so on their own responsibility and at their own risk.
Overview

The 2018 Amendment to the Waste Framework Directive (2008/98/EC) passed into law calls for member states to promote sustainable use of resources and industrial symbiosis. As industrial symbiosis is further integrated into the policies, reports and recommendations of the European Commission across multiple DGs and various member states at the national, regional and local scale, the variety of terminologies used in these documents can be confusing and sometimes misleading to those wishing to implement industrial symbiosis. Such confusion dilutes the effectiveness of the approach to deliver resource efficiency, greenhouse gas reduction and economic benefits.

Resource efficiency through industrial symbiosis offers economic opportunities for European industry. This CEN Workshop Agreement (CWA) is intended to help organisations, governments and individuals consider and implement industrial symbiosis. To support the effective adoption of industrial symbiosis by the public and private sector and to advance toward mainstream adoption, this CWA provides a consensus on the core elements of industrial symbiosis to enable its identification and on good practice approaches to industrial symbiosis implementation across Europe and beyond. These common elements and approaches can form the basis for policy, recommendations and widespread implementation.

Specifically, this CWA sets out the following:
1. Core elements of industrial symbiosis;
2. Drivers for industrial symbiosis;
3. Approaches to industrial symbiosis;
4. Industrial symbiosis implementation: good practice.

Industrial symbiosis is the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of keeping resources in productive use for longer. Core elements of industrial symbiosis are the aspects that enable its identification. Elements considered core to industrial symbiosis are:

- Returning underutilised resources (often called waste) to productive use;
- Information about opportunities (e.g., data on other organisations’ resources, or new technologies) is required to be able to advance a synergy;
- Business conditions incentivising industrial symbiosis, which may be through market conditions or through policies and regulations; and

Four common approaches to industrial symbiosis (that are not mutually exclusive) vary depending on where the onus for identifying and advancing opportunities lies:
1. Self-organised: a bottom-up approach resulting from direct interaction among industrial actors, without external coordination. Expertise resides within the organisations with resources and opportunities; organisations identify, assess and advance opportunities themselves.
2. Facilitated: wherein a third-party intermediary coordinates the activity, working with organisations to identify opportunities and help bring them to fruition. Facilitators (sometimes referred to as practitioners) work with the companies to identify, assess and advance opportunities; often the onus is on the facilitators to progress opportunities. Facilitator business models vary from commercial brokers to public investment networks and any combination thereof.
3. ICT-supported: industrial symbiosis activity is supported by an ICT system to capture and manage data on resource availability and potential synergies. The onus lies with the software users, be they companies, other organisations or facilitators.
4. Strategic or planned: a top-down approach where networks are formed following a central plan or vision that includes attracting new businesses to regeneration sites or purpose-built developments. The onus lies with the central body (often public sector) implementing the plan or vision.

Good practice implementation in any approach requires the following steps:

1. Fully characterising the resources available: thinking broadly about resources (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials); and reassessing waste for value as a resource.

2. Identifying and assessing opportunities to return underutilised resources to productive use: statistically, most (not all) reuse opportunities are outside one's own sector, so cross-sector knowledge may be required.

Matching the available resource with the appropriate opportunity, addressing technical, economic, and legal requirements. Intermediate transformation steps may also be required.
1 Scope

Industrial symbiosis is the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of keeping resources in productive use for longer. It presents a systems approach to a more sustainable and integrated industrial economy that identifies business opportunities to improve resource utilisation and productivity. The objectives of this CEN Workshop Agreement (CWA) are to support the mainstream adoption of good practice approaches proven through implementation by advancing the mutual understanding of actors (public, private, third sector, and community) currently using the term industrial symbiosis in different ways. This CWA is intended to help the above actors consider and implement industrial symbiosis.

2 Normative references

The following standards-related references are central to this document:

- BS 8001: 2017 "Guidelines to a Circular Economy" and references therein

- IWA 27: 2017 "Guiding principle and framework for the sharing economy"
  [https://www.iso.org/standard/72643.html](https://www.iso.org/standard/72643.html)

The following related references (reports, policies) are central to this document:

There are multiple directives that mention industrial symbiosis and its relationship to resource efficiency within the European Union, although few are specific to industrial symbiosis as a focus; rather, industrial symbiosis is included as support to their primary aims. Some of the most relevant documents are listed below:


- DG GROW, Cooperation fostering industrial symbiosis: market potential, good practice and policy actions (2018)


- European Commission Communication: GREEN ACTION PLAN FOR SMEs, Enabling SMEs to turn environmental challenges into business opportunities (2014)

A review of how the term ‘industrial symbiosis’ is used in the European institutions’ documentation (legislative and beyond) has produced the following examples:

— **Council of the European Union:** Since 2013, there have been many references but only 2 occasions whereby there is an attempt to describe the term: one as a ‘new business model’, and one as a ‘user-driven innovation business model’.

— **European Parliament:** There have been many references to industrial symbiosis since 2013. It is referred to as ‘turning one industry’s by-product into another industry’s raw material.’ From the European Parliamentary Research Service, ‘Industrial symbiosis engages different organisations in a network to foster eco-innovation and long-term culture change. It provides mutually profitable transactions for novel sourcing of required inputs, value-added destinations for non-product outputs, and improved business and technical processes’ citing Lombardi and Laybourn (2012a).¹

— **European Commission** – Findings are divided into the various Directorate-Generals:
  
  o **DG Environment:** There are several mentions of the term industrial symbiosis. Referring to NISP®, a facilitated industrial symbiosis activity: “It is a business opportunity programme that develops mutually profitable links between traditionally separate companies from all industrial sectors and of all sizes so that previously unused or discarded resources such as energy, water and/or materials from one company can be recovered, reprocessed and re-used by other companies in the industrial member network.” Further links to global agendas are made here: “...with respect to industrial symbiosis, knowledge transfer and the shift towards a circular and green economy, particular attention should be given to resource efficient, environmentally-sound performance of businesses, including the value chains, and on the harmonisation of the methodology for measuring their ecological footprint.”

  o **DG Grow:** also cites Lombardi and Laybourn (2012a)² in its 2018 report³ to encourage broader uptake of industrial symbiosis for economic benefit.

---


² Ibid

DG Regio: There is an indirect definition in one of its publications, ‘The Industrial Symbiosis Network helps to identify opportunities to recover and reprocess waste products from one industry that can then be re-used by other businesses. This, in turn, reduces the amount of waste going to landfill, cuts carbon emissions and creates greener jobs. In essence, it is a brokerage initiative to increase business opportunities and contribute to the sustainable growth of the region.’

DG Research describes industrial symbiosis in the text of the H2020 2014 call on waste: ‘Industrial symbiosis, whereby different actors derive mutual benefit from sharing utilities and waste materials, requires large-scale systemic innovation with the aim of turning waste from one industry into useful feedstock for another one.’

DG Secretary General was responsible for coordinating the policy work that went into the circular economy package. Industrial symbiosis is communicated as: ‘turning one industry’s by-product into another industry’s raw material’. On a separate occasion industrial symbiosis is referred to as ‘an innovative industrial process’.

3 Terms, definitions and abbreviation

3.1 Terms and definitions

3.1.1 alternative fuel
any fuel with a potential for long-term non-renewable fuel substitution


3.1.2 by-product
substance or object, resulting from a production process, the primary aim of which is not the production of that item fulfilling the following points:
(a) further use of the substance or object is certain;
(b) the substance or object can be used directly without any further processing other than normal industrial practice;
(c) the substance or object is produced as an integral part of a production process;
(d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.


3.1.3 cascading use
in general, means a sequence of use phases with declining product value. Cascading allows the use of resources (materials and water) to be extended. For instance, using biomass as a production material first, then recycling it (several times) before finally recovering the energy content from the resulting waste at the end of its lifecycle. Such cascading systems may provide general advantages for climate change mitigation and ease land use pressure
3.1.4  
circular economy
where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised, making an essential contribution to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy

REFERENCE: Closing the loop - An EU action plan for the Circular Economy. COM/2015/0614 final.  

3.1.5  
eco-innovation
refers to innovation that results in reduced environmental impact, no matter whether or not that effect is intended. Eco-innovation is not limited to innovation in products, processes, marketing methods and organisational methods, but also includes innovation in social and institutional structures. Eco-innovation is seen as key to achieving the transition to a sustainable economy

REFERENCE: OECD, 2009. Eco-innovation in Industry: Enabling Green Growth. Available at:  

3.1.6  
emission
the direct or indirect release of substances, vibrations, heat or noise from individual or diffuse sources from an installation into the air, water or land

REFERENCE: The Environmental Permitting (England and Wales) Regulations 2010  

3.1.7  
energy efficiency
refers to the ratio of output of performance, service, goods or energy, to input of energy


3.1.8  
industrial ecology
the study of the means by which humanity can deliberately and rationally approach and maintain a desirable carrying capacity, given continued economic, cultural, and technological evolution. The concept requires that an industrial system be viewed not in isolation from its surrounding systems, but in concert with them. It is a systems view in which one seeks to optimize the total materials cycle from virgin material, to finished material, to component, to product, to obsolete product, and to ultimate disposal.


3.1.9  
matchmaking
the process of identifying organisations with the potential to establish a synergy
3.1.10

**material stream**

refers to the aspects of a stream as a substance mainly in terms of mass or volumetric flows

3.1.11

**production residue**

refers to a material that is not deliberately produced in a production process but may or may not be a waste


3.1.12

**raw material**

the basic input material to make a product in an industrial facility

3.1.13

**recycling**

any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations


3.1.14

**resources**

defined by UNEP and OECD as the naturally occurring assets that provide use benefits through the provision of raw materials and energy used in economic activity (or that may provide such benefits one day) and that are subject primarily to quantitative depletion through human use. They are subdivided into four categories: mineral and energy resources, soil resources, water resources and biological resources. Resources for a business are more inclusive than just materials and equipment, including also (for example) human resources. This CWA uses ‘resources’ to have this breadth of interpretation

3.1.15

**resource efficiency**

about ensuring that natural resources are produced, processed and consumed in a more sustainable way, reducing the environmental impact from the consumption and production of products over their full life cycles. By producing more wellbeing with less material consumption, resource efficiency enhances the means to meet human needs while respecting the ecological carrying capacity of the earth


3.1.16

**SPIRE**

refers to the Public-Private Partnership in the European process industries sectors of ceramics, cement, non-ferrous metals, chemicals, minerals, steel, water and engineering

REFERENCE: [https://www.spire2030.eu/](https://www.spire2030.eu/)
3.1.17

Synergy

The creation of an integrated whole that has a greater value than the addition of its parts. Industrial symbiosis ‘synergies’ are transactions where one organisation acquires underutilised resources (by-products, waste, materials, energy, water, equipment or other resources that are not the primary output of the production process) from the organisation generating them, and integrates them as inputs into their own production process. Synergies are predominantly bilateral (organisation to organisation) or multi-lateral (between many organisations) but can also be within a single organisation.

3.1.18

Waste

Any substance or object which the holder discards or intends or is required to discard.


3.1.19

Sustainable Development Goals (SDGs)

Otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. These 17 Goals build on the successes of the Millennium Development Goals, while including new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities. The goals are interconnected – often the key to success on one will involve tackling issues more commonly associated with another.


3.2 Abbreviations

CSR Corporate Social Responsibility
CWA CEN Workshop Agreement
OECD Organisation for Economic Co-operation and Development
SCP Sustainable Consumption and Production
SDG Sustainable Development Goals
UNEP United Nations Environment Programme
Core Elements of Industrial Symbiosis

Industrial symbiosis presents a systems approach to a more sustainable and integrated industrial economy which identifies business opportunities to improve resource utilisation. Industrial symbiosis ‘synergies’ are transactions where one organisation acquires underutilised resources (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials that are not the primary output of the production process) from the organisation generating them, and integrates them as inputs into their own production process.

The concept of industrial symbiosis in the academic literature is traced back to the seminal article by Frosch and Gallopoulos in Scientific American (1989) where the authors envisioned “industrial ecosystems” in which “the consumption of energy and materials is optimized and the effluents of one process serve as the raw material for another process.” Several industrial sectors have incorporated similar principles into standard operating procedures for many years, including cement and chemicals.

Core elements of industrial symbiosis are the aspects that enable its identification. Elements considered core to industrial symbiosis are:

- Returning underutilised resources (often called waste) to productive use. Transactions (synergies) involving material, energy and water tend to be at the core of industrial symbiosis, but non-material resources such as expertise, capacity and logistics can be equally valuable.

- Information about opportunities (e.g., data on other organisations’ resources or new technologies) is required to be able to advance a synergy.

- Business conditions incentivising industrial symbiosis, which may be through market conditions (cost reduction, risk reduction, improved competitiveness) or through policies and regulations that specify definitions (for example, waste versus by-product) and responsibilities.

Optional dimensions that may occur in some synergies and not in others:

- Collaboration through networks: A diverse network of organisations of all sectors and sizes contributes to success, as most opportunities lie outside one’s own sector. Sectors including Government, third sector, research and the community each can contribute to industrial symbiosis, bringing new ideas and stimulating further activity. A formal network is not required for an actor to pursue industrial symbiosis (e.g., in the self-organised approach).

- Innovation: Often an industrial symbiosis opportunity entails innovative diversification of the business-as-usual supply chain.

Shared services: Sharing may reduce the environmental impact of the services, which is in line with the goal of industrial symbiosis, but if those services are not derived from previously underutilised resources (such as another organisation’s wastewater being converted to input) then it may not be aligned with the core elements of industrial symbiosis described above.

Drivers for Industrial Symbiosis

Over the last decade and more, industrial symbiosis has been taken up on every continent, successfully crossing cultures and economies. Industrial symbiosis has proven successful not only in diverting waste from landfill or incineration, but also in closing the resources loop and moving waste up the value chain. The industrial symbiosis approach delivers benefits across the 3 pillars of sustainability (economic, social and environmental) and supports the delivery of a more circular economy. The European Resource Efficiency Platform championed industrial symbiosis as a mechanism for reducing carbon, preserving critical resources and securing business sustainability. It is recognised as a driver and accelerator of innovation. Recently, industrial symbiosis has gained increasing attention as a mainstream approach for

---

helping to deliver the circular economy\(^5\) through the reduction of waste, emissions and primary resources consumption as priorities. The following five drivers were identified and explored at the International Working Conference on Applied Industrial Symbiosis (2012)\(^6\) and reinforced in the 2018 report commissioned by DG GROW “Cooperation for Industrial Symbiosis”\(^7\).

**Economic/business impact:** Generally industrial symbiosis is motivated by economic impacts delivered through mutually beneficial transactions that reduce cost or risk, generate revenue, or otherwise solve a business problem for the parties. Organisations engage in industrial symbiosis when the business case for doing so is clear – current and historical economic returns have been demonstrated in many countries. The increasing attention to sustainability and resource security issues further drives business engagement, as can a CSR agenda. At the 2015 G7 Alliance for Resource Efficiency Workshop on Industrial Symbiosis\(^8\), UNEP mapped industrial symbiosis to the delivery of six SDGs:

- Decent Work and Economic Growth (8)
- Industry Innovation and Infrastructure (9)
- Sustainable Cities (11)
- Responsible Consumption and Production (12)
- Climate Action (13)
- Partnerships (17).

**Eco-innovation:** The OECD (2012) cited industrial symbiosis as a form of systemic eco-innovation ‘vital for future green growth’, recognising its role as a catalyst for demand-led business innovation, helping to bring novel and innovative products, processes and technologies to market. DG Secretary General also refers to industrial symbiosis as an ‘innovative industrial process’.

**Regional economic development:** Regional economic development that draws on existing key industrial activity and resource streams can lower the carbon footprint of development, while strengthening local economies through improved material and energy security. Some regional and local governmental bodies are implementing industrial symbiosis to attract and retain businesses in their region – as in Birmingham UK, where an industrial symbiosis approach has been integrated into the economic development plan to reinvigorate the Tyseley Environmental Enterprise District. In the 10th Development Plan of Turkey, environmental protection and sustainable use of resources are among the priority goals: industrial symbiosis is defined as a strategic tool to achieve these goals in many national policy documents such as Priority Transformation Programme for Enhancing Productivity in Manufacturing, SME Strategy and Action Plan (2015-2018), National Efficiency Strategy and Action Plan (2015-2018) and National Cleaner Production/Eco-efficiency Strategy (2014-2017). It is also defined as a tool for reaching eco-efficiency and regional competitiveness objectives in regional policy documents, explicit in 19 out of 26 regional development plans prepared by Turkish regional development agencies.

**Resource security:** Risks associated with critical resource supply may be managed in part through managing demand, and in part through resource recovery at end of life, increasing supply. An industrial symbiosis approach is an effective means to move resources up the waste hierarchy: it reduces the use of virgin materials and water through substitution, identifies novel reuse and recycling opportunities for existing waste and by-products, diverts materials from the waste stream and prevents waste generation.

**Energy security and climate change mitigation:** Governments and companies around the world are focused on addressing energy concerns, both by improving efficiency (of generation, distribution, and processes), and by decarbonisation. Carbon footprint may also be reduced by cascading resources

---

7. *Ibid*
8. [https://www.international-synergies.com/projects/g7-workshop-on-industrial-symbiosis/](https://www.international-synergies.com/projects/g7-workshop-on-industrial-symbiosis/)
through multiple uses, keeping materials circulating in the economy and reducing the level of activity in extraction, refinement, transport and processing. Industrial symbiosis enables carbon reduction (including embedded carbon) through: efficiency improvements, novel fuel substitution, process innovation, heat recovery, avoided transport energy, and avoided virgin material extraction.

6 Approaches to Industrial Symbiosis

Four non-mutually exclusive approaches to industrial symbiosis have evolved. These are:

1. **Self-organised**: a bottom up approach resulting from direct interaction among industrial actors, without any external coordination, generally motivated by business concerns arising from context, including resource risk, pending legislation, and economic gains.

   **Self-organised Industrial Symbiosis Case study: Kalundborg, Denmark**

   The term industrial symbiosis has its origins in the Danish municipality of Kalundborg, the first recognized and best-known example of an industrial symbiosis network. Resource sharing by companies from different industries in Kalundborg, Denmark began because of the low availability of groundwater and the need for a surface water source which, once identified, became a key part of their resource network. The first synergies were in the 1970s, and additional synergies continued to develop into the 1980s. The Kalundborg self-organization was initiated by the private sector to achieve goals including cost reduction, revenue enhancement, business expansion, and securing long-term access to water and energy.

---


2. **Facilitated**: where a third-party intermediary coordinates the activity, working with organisations to identify opportunities and bring them to fruition. Industrial symbiosis practitioners play the critical role of facilitating and co-ordinating the contributions of the various stakeholders. By engaging with organisations from all sectors, the practitioner enables the flow of information across sectoral boundaries; practitioners often provide technical support to overcome technical or regulatory barriers associated with synergies.

Facilitators come from the private sector (as in NISP England), the public sector (for example, City of Manresa, Spain; Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) Italy), academia (for example, Erasmus University Rotterdam, Netherlands), or the third sector (for example, GreenCape, South Africa). In all cases, the investment is in their time to build a network, gather information, and facilitate synergies to completion. At least for NISP England (2005-2010), the public investment returned a benefit cost ratio of between 32 and 53 to 1. These activities can be directed to achieve specific targets: for example, if success is determined by achieving substantial landfill diversion, then target sectors are likely to include construction, cement, and foundries for the large volumes of materials mobilised. If instead the key metric is innovation, the coordination focuses on attracting entrepreneurs and innovators.

### Facilitated Industrial Symbiosis Case study: NISP®

The most cited facilitated approach to industrial symbiosis in European policy is the NISP® methodology. First developed in the UK by International Synergies Ltd, it has since been replicated in over 20 countries on 5 continents. The NISP model involves expert facilitators (practitioners) gathering information from companies, making expert assessments, then identifying and facilitating synergy opportunities through to completion. The success of NISP has inspired many parties to implement industrial symbiosis across Europe: current activity largely comprises regional efforts supported by public-sector investment. This holistic approach has demonstrated in practice verified positive impacts including cost reduction, additional sales; reduction in materials, water and energy use; innovation, knowledge transfer and best practice sharing, capacity utilisation, and job creation.

3. **ICT-supported**: Part of the challenge of industrial symbiosis in practice is that most opportunities for a given organisation lie outside one’s own sector. Decision-makers in industry today will have experience deriving primarily from a single industry; going outside one’s own sector, and traditional supply chain, requires support. This market failure of information in relation to resource efficiency can be addressed through mechanisms that improve information flow between actors.

The concept of ICT to support industrial waste reuse dates back to the 1970's when information exchanges were first established. More recently web-based waste exchanges have proliferated as the technology has developed. Passive online waste exchanges have had very limited uptake in Europe and around the world, which is attributed to their inability to meet the specific information needs of industrial users (including classification, contamination, distribution and timing issues) and the lack of mainstream buy-in to industrial symbiosis.

---

ICT-enabled Industrial Symbiosis Case study: SYNERGie®4.0

International Synergies Limited SYNERGie®4.0 system bespoke to industrial symbiosis support. SYNERGie®4.0 delivers resource database, project management, impact reporting and customer relationship management functionalities, and is proven in practice hosting over 40,000 resources from over 20,000 companies worldwide. The most established ICT system supporting industrial symbiosis has been developed by practitioners to support their activity, and then extended to more general (non-expert) use.

4. **Strategic or planned**: a top-down approach where networks are formed following a central plan or strategic vision that includes attracting new businesses to regeneration sites or purpose-built developments. Industrial symbiosis in existing enterprise/commercial zones is based on existing resource flows, infrastructure and economic activity; the analysis identifies opportunities for strategic economic development that increases the productivity of existing resources, reduces carbon emissions, and attracts new investment and green business growth through industrial symbiosis. The approach has been applied to existing industrial parks and industrial areas of a city.

Planned Industrial Symbiosis Case study: Sustainable Devens (USA)

The Massachusetts economic development agency converted a former military base in Devens into a planned community and gave the Devens Enterprise Commission (DEC) the mission to integrate into its development and management the principles of sustainable development and industrial ecology (including industrial symbiosis).

Businesses operating in the Devens eco-industrial area are largely SMEs in the sectors of high tech, logistic, manufacturing, etc. The programme aims at fostering networking and environmental commitment among onsite and other local firms. DEC’s environmental policy criteria include by-products and information exchanges, joint purchasing, recycling, sustainable building, reduced use of toxic chemicals, mutual aid to reach standards, etc.

Case study source: Massard et al (2014)

Information: [http://www.devensec.com/sustain.html](http://www.devensec.com/sustain.html)

These approaches are not mutually exclusive: Kalundborg was self-organised until 1996 when a coordinating organization, the Symbiosis Institute, was launched as part of Kalundborg’s industrial development agency to accelerate the number and complexity of new synergies. NISP® in England was facilitated throughout its life but started without ICT support in its early days. ICT enabled approaches may or may not include facilitation. Strategic/planned approaches may involve facilitators and/or ICT support.
7 Industrial Symbiosis Implementation: Good Practice

7.1 Factors Enabling Good Practice

- Facilitation (through full time or substantial commitment) is necessary to advance synergies to completion.
- Public sector investment has led to macro-economic impact which contributes to the economy as a whole through multiplier effects and has proven value for money/return on investment.\(^{12}\)
- A policy enabling context supportive of industrial symbiosis does not introduce legislative or regulatory barriers to industrial symbiosis, but rather incentivises it.
- Advancing synergies (with or without facilitation) requires an investment on the part of the organisations involved, in time if not capital. The communication of industrial symbiosis must be clearly focused on the benefits to be derived from the activity to gain the organisation's buy-in and investment.
- ICT (software) supports data management and impact tracking to overcome information barriers to industrial symbiosis.
- Industrial diversity in a region enhances the chance for industrial symbiosis\(^{13}\) as most (not all) reuse opportunities are outside one's own sector.
- Various factors determine how far a resource will travel, including the market (price, cost), regulation and legislation: in England, documented NISP® synergies have moved textiles, metals, minerals and paper/card over 200 miles.\(^{14}\) Steam and heat synergies are limited to local opportunities.
- A diverse network engaging business across all sectors and sizes, research and the government has proven to foster knowledge transfer and demand-led innovation by bringing together the companies with real problems, and the researchers able to address, and sometimes resolve, them. In the UK's NISP experience, over 70% of synergies have been shown to involve some form of innovation: 50% cross-sector knowledge transfer and best practice, and 20% new research and development deriving from close links with universities.
- A clear monitoring and evaluation framework established from the beginning of activity will provide the relevant information for assessing return on investment (for public sector, most common) and capturing the economic, environmental and social impacts.
- Targets and constraints drive activity: where desired outputs are defined in goal-directed approaches, then effort will first be directed to those sectors/materials that are most likely to deliver the priority outputs (be they environmental, economic or social, or any subset thereof).

7.2 **Actions Representing Good Practice**

- Fully characterise the resources available: think broadly about resources (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials); and reassessing waste for value as a resource.

- Identify and assess opportunities to return underutilised resources to productive use: statistically, most (not all) reuse opportunities are outside one's own sector, so employ cross-sector knowledge as required.

Match the available resource with the appropriate opportunity, addressing technical, economic, and legal requirements. Intermediate transformation steps may also be required.
List of references


Appendix 1: Case studies

DECHEMA Technology Study 2017, Low carbon energy and feedstock for the European chemical industry. Available at: https://dechema.de/dechema_media/Downloads/Positionspapiere/Technology_study_Low_carbon_energy_and_feedstock_for_the_European_chemical_industry-p-20002750.pdf

European Circular Economy Stakeholder Platform: https://circulareconomy.europa.eu/platform/


Case Study, Construction and Demolition Waste as input to Cement Manufacture: https://www.lafargeholcim.com/austria-construction-waste-recycling


Case study, Alternative Raw Material inputs to Cement Manufacture:
Appendix 2: Indicators

The following reports address the status of indicators for industrial symbiosis:


Appendix 3: Supplementary Guidance


Appendix 2 CWA Secretariat contract with SIST
CEN Workshop Agreement on Industrial Symbiosis: Proposed activities and timeline
15 December 2017

Project information

<table>
<thead>
<tr>
<th>Sponsor</th>
<th>International Synergies Limited, Newhall Place Unit 5, Newhall Hill, Birmingham, B1 3JH on behalf of the EU SHAREBOX project (<a href="http://sharebox-project.eu/">http://sharebox-project.eu/</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services</td>
<td>To provide secretariat services for a CEN workshop on a Specification for a Methodology for Industrial Symbiosis.</td>
</tr>
<tr>
<td>Deliverable</td>
<td>Published CWA</td>
</tr>
<tr>
<td>Thematic Context</td>
<td>Industrial symbiosis is the use by one company or sector of by-products or waste (including energy, water, logistics, capacity, expertise, equipment and materials), from another. Industrial symbiosis has proven successful not only in diverting waste from landfill, but also in contributing to the preservation of resources, moving waste up the value chain, and accelerating innovation. The CWA will aim to establish a methodology for implementing an industrial symbiosis process in various models. This will include a common vocabulary, a definition and outline of industrial symbiosis practices and implementation methodologies.</td>
</tr>
</tbody>
</table>

Project Activities (SIST and ISL, Roles and Responsibilities)

General

- All project activities will be conducted in English
- No charges (e.g. attendance fees) levied on workshop attendees
- The kick off and 1st workshop meeting is to be held in Brussels. All other workshops are virtual.

SIST:

- CWA Administration on behalf of ShareBox as required by CEN/CENELEC
- Publication of the workshop Project Plan by SIST to commence 30-day workshop announcement
- The Secretariat will be required to invite participants, and ensure registration
- The Secretariat will be required to attend Workshop meetings
- Review of drafts and final WA for consistency with CEN guidelines
- Review final workshop agreement and submission of approved document for publication
- Submission of final CWA to CEN/CENELEC for publication using the CEN drafting template
- Expenses incurred for SIST staff on this project for travel accommodation and meals should be included within the price quoted

International Synergies Limited on behalf of ShareBox:

- Creation of the workshop Project Plan in accordance with CEN/CENELEC guidelines
- Providing SIST with list of delegates attending the workshop and suggested workshop dates
• Author the draft WA and subsequent revisions taking account of workshop agreement and post-workshop comments

• Sharebox will provide local hosting of the kick-off and first working meetings.

**Indicative Timescale**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Estimated Date</th>
<th>Duration</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CEN/WS Project Plan submitted to CCMC</td>
<td>December 2017</td>
<td></td>
<td>Submitted early December</td>
</tr>
<tr>
<td>2</td>
<td>Announcement of the intended CEN WS on CEN website. Collection of comments in response to announcement.</td>
<td>December 2017</td>
<td>30 days notice</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Announcement of the Kick Off and 1st CEN Workshop (to be held together, back to back)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Circulation of Base Document to be discussed at 1st workshop</td>
<td>January 2018</td>
<td>Min 4 wks to review</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CEN WS Kick Off Meeting. Approval of Project Plan (taking comments into account), the Secretariat and the Chair</td>
<td>Feb 2018* subject to J. Potocnik diary</td>
<td>1/2 day</td>
<td>Brussels</td>
</tr>
<tr>
<td>6</td>
<td>1st Workshop Plenary Meeting (follows directly on Kick Off meeting) to discuss Base Document and comments</td>
<td>February 2018</td>
<td>1/2 day</td>
<td>Brussels</td>
</tr>
<tr>
<td>7</td>
<td>Create CWA Draft 1</td>
<td>March 2018</td>
<td>30 days</td>
<td>Assimilates agreements for Workshop 1</td>
</tr>
<tr>
<td>8</td>
<td>Circulation of 1st Draft CWA and collection of comments by the Workshop participants</td>
<td>March 2018</td>
<td>Min 2 wks to review</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2nd Workshop Plenary Meeting, discuss 1st draft CWA and collect comments</td>
<td>April 2018</td>
<td>1/2 day</td>
<td>Virtual meeting</td>
</tr>
<tr>
<td>10</td>
<td>Create CWA Draft 2.</td>
<td>May/June 2018</td>
<td>30 days</td>
<td>Assimilates agreements for Workshop</td>
</tr>
<tr>
<td>11</td>
<td>Circulation of 2nd Draft CWA and collection of comments by the Workshop participants</td>
<td>June 2018</td>
<td>30 days</td>
<td>End of June.</td>
</tr>
<tr>
<td>12</td>
<td>Final CWA Plenary Meeting. Final version approval.</td>
<td>July 2018</td>
<td>1/2 day</td>
<td>Virtual meeting</td>
</tr>
<tr>
<td>13</td>
<td>Publication of CWA after editorial check by CCMC</td>
<td>September 2018</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Price:** The total price for the services is €13,500 without public consultation, including SIST expenses, excluding VAT. Of this amount, SIST will be required to pay €1,000 to CEN CENELEC for the open access CWA.

**Acceptance:** We hereby agree the services and general conditions relating to services as set out in this the proposal.

SIGNED: 

DATE: .... 15 Dec 2017 

NAME: .... Peter Laybourn...

POSITION: . Chief Executive...

ORGANISATION: ...International Synergies Ltd..

SIGNED: 

DATE: .... 15 Dec 2017 

NAME: .... Marjetka Strle-Vidali....

POSITION: ... Director..................

ORGANISATION: ......Slovenian Institute for Standardization