SWAN Platform - a Web Based Tool to support the Development of Industrial Solid Waste Reuse Business Models

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Abstract

The SWAN platform is an integrated suite of on-line resources and tools for assessing industrial symbiotic opportunities based on solid industrial waste reuse. It has been developed for the purposes of the SWAN Project, a project of the transnational Cooperation Programme Interreg V-B "Balkan-Mediterranean 2014-2020" aiming to develop a digital solid waste reuse platform for the Balkan region and Cyprus.

The SWAN platform integrates a database with the spatial and technical characteristics of industrial solid waste producers and potential consumers, which will be populated with data from all four countries involved in the project; i.e. Greece, Bulgaria, Albania and Cyprus. It also incorporates an inventory of commercially implemented best practices on solid industrial waste reuse.

The SWAN platform hopes to be the facilitator in the development of novel business models based on solid industrial waste reuse in the Balkan region. Towards this end, it will allow the registered users to run the SWAN matching algorithms and identify and assess potential novel business models based on solid waste reuse, either for an individual industrial unit (source/potential receiver of solid waste) or a specific region.

Keywords: Solid Waste, Industrial Symbiosis, SWAN Project, Web Based Tool

1. Introduction

The current European waste management framework defines waste as any substance or object which the holder discards or intends or is required to discard. Furthermore, effective material management and resource recovery are currently major components of the EU environmental policy. Towards that end, the development of novel business models based on industrial symbiosis (i.e. reusing unwanted waste streams of one industry as an input to another one) is highly promoted. However, the "end-of-waste" criteria should be taken into account to make sure that an output stream is no longer considered waste and can be reused as an input.

The SWAN platform is being developed in order to facilitate the development of such business models in the Balkan region, by (a) providing a detailed mapping of solid waste sources and potential receivers and (ii) assessing the economic feasibility of all the technically feasible symbiotic schemes in the area.

2. Existing Industrial Symbiosis Management/ Optimization Tools

In the early 2000s, several Information and Communication Technology (ICT) tools have been developed in an attempt to support and facilitate the implementation of Industrial Symbiosis (IS) schemes. Grant et al. (2011) have listed the most important of them, stating that these were developed at an early period of IS development. Thus, the applicability and the results of these efforts were ambiguous.

In recent years, more elaborate methods have been used in the development of these ICT tools, the most important of which are: (a) e-Symbiosis, an online platform that introduced the use of ontology engineering in the field of industrial symbiosis, focusing on Small and Medium Enterprises (SMEs), and has been validated using real-life data (Cecelja et al., 2015); (b) Looplocal, a generic heuristic visualization tool aiming to identify the regions that are potentially good candidates for IS implementation and to assess the strategies to promote such schemes (Aid et al., 2015); (c) SymbioSyS, an online tool that implemented a waterfall model with a dynamic knowledge base in order to identify and visualize suggested IS in a given region, validated in an existing industrial park with 25 SMEs (Alvarez & Ruiz-Puente, 2017); (d) By-product Exchange Network (BEN) model, a collaboration platform using an agent-based modelling approach with an objective function maximizing the transaction value of the model, validated using real-life data from Singapore (Raabe et al., 2017).

The Core Resource for Industrial Symbiosis Practitioners (CRISP) portal system acted as the support system for the UK's National Industrial Symbiosis Programme (Jensen et al., 2011), while big data analytics has been also studied (Song et al., 2017).

3. SWAN Platform

The SWAN Platform is currently being developed, by incorporating key characteristics from all the above-mentioned tools. It will be a mapping and matching simulation tool and will be designed with a standard "look and feel" to facilitate ease of use, software design simplification, and branding. It will employ an N-Tier Application Architecture and will be a web application requiring only network access and a web browser for end-user access.

Seven different user groups (Public, Registered Users, Industry Managers, Industry Participants, Regional Authority Managers, Regional Authority Participants, and System Administrators) have been defined for the platform, each one with their specific user functionalities and permissions.

The main functionality of the platform will be: (a) the mapping of all the industrial sources of solid waste and the all the potential receivers (Figure 1) and (b) their technical and economic matching to identify the economically viable national and transnational symbiotic schemes.
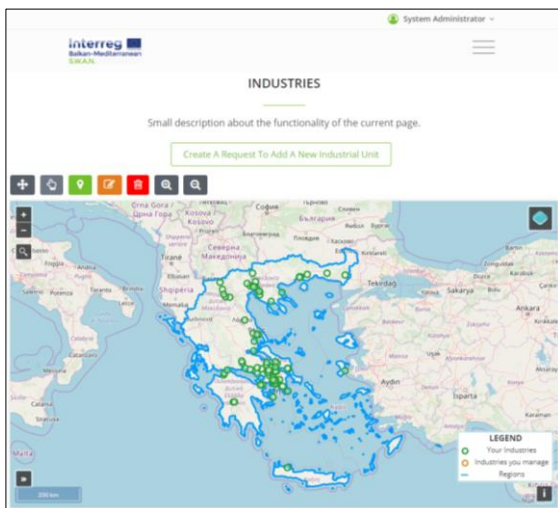

Figure 1. Mapping functionality of the tool

The database of the platform will be populatted with all the necessary information for the industrial solid waste sources and potential receivers. Data will be collected using questionnaires from all four SWAN case studies/countries (Greece, Albania, Bulgaria and Cyprus). The database will also include an inventory of the already implemented best practices (Figure 2) towards industrial symbiosis, which will facilitate the matching functionality of the SWAN algorithm.
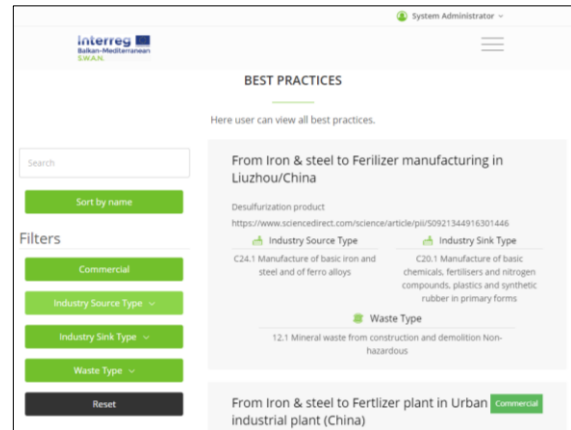

Figure 2. Inventory of Best Practices on industrial solid waste reuse

4. Future Work

The next step in the development of the tool is the implementation of the matching algorithm and its validation using real life data from the four countries. The finalization of the platform is expected during the second half of 2019.

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