



Green and sustainable innovation for cleaner production in the Asia-Pacific region



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ABSTRACT

Considering the history of cleaner production in the Asia-Pacific region, there have been sustained efforts to develop cleaner production techniques and also techniques for sustainability assessment to ensure that the desired benefits from cleaner production are actually achieved. Two conferences, the Asia Pacific Roundtable on Sustainable Consumption and Production (APRSCP) and the International Conference on Green and Sustainable Innovation (ICGSI) have been organized regularly to bring together experts on cleaner production as well as assessment. Papers presented at these events form part of this special volume along with some invited papers from outside. The papers cover a wide range of topics under the cleaner production umbrella including product and process development and innovation, environmental assessments including carbon footprint, water footprint, life cycle assessment and more comprehensive sustainability assessment including socio-economic issues along with environmental ones. The papers in this special volume reflect the status of green and sustainable innovation for cleaner production in the Asia-Pacific region. The studies in this volume demonstrate Asian examples of the development of innovative technologies and the application of life cycle thinking-based assessment techniques, including those that are well-established and emerging ones.

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1. Introduction

Current over-consumption and environmental degradation patterns have led to efforts to reduce human over-exploitation of natural resources (Munasinghe, 2014). Sustainable consumption and production (SCP) has been an effective way to address these serious issues (Tseng et al., 2013). Green and sustainable innovation is a key to social, technological and economic development of countries around the world (Kilkis, 2016; Working Group on Decoupling, 2011). A holistic or life cycle-based approach is essential for sustainable development to avoid unintended shifting of problems between life cycle stages or between various sustainability aspects (Guinée et al., 2011). Life Cycle Assessment (LCA) has been used as an environmental analysis tool to evaluate the potential environmental impacts of products or services along its life

cycle. Through a cradle-to-grave perspective, LCA and other life cycle-based techniques such as LCM (Life Cycle Management), LCC (Life Cycle Costing), and SLCA (Social Life Cycle Assessment) have gained a continuous interest in assessing sustainability and as decision support tools for consumers, businesses and governments (Piekarski et al., 2013; Gheewala and Mungkung, 2013; Silalertruksa et al., 2012). These techniques, particularly the underlying concept of life cycle thinking, support sustainable consumption and production (Liu et al., 2016; Lehtoranta et al., 2011).

This special issue of the Journal of Cleaner Production was initiated around two events organized in Bangkok, Thailand during May 2014 – the 11th Asia Pacific Roundtable on Sustainable Consumption and Production (11thAPRSCP 2014) and the 4th International Conference on Green and Sustainable Innovation (ICGSI 2014) in conjunction with the 3rd LCA AGRI-FOOD ASIA. The APRSCP provided a platform for multi-stakeholders from Asia and the Pacific to come together to share experiences and lessons learned in scaling up existing and new SCP technologies, strategies, tools and approaches through research and information awareness, capacity building, financing, and monitoring and evaluation.

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The ICGSI provided an international scientific forum for researchers, practitioners, academics, and professionals for updating the new knowledge and application of life cycle thinking to sustainability assessment. In recent years, LCA in the agri-food sector has developed rapidly, in particular for sustainable agriculture, sustainable intensification of food production systems, innovation technology of low-carbon products and for guiding consumers toward more sustainable food-consumption patterns (e.g., via carbon footprint label). LCA AGRI FOOD ASIA therefore served as a forum for experience sharing and collaborative research activities at the regional level.

This special issue of the Journal of Cleaner Production is thus directed towards articles concerning life cycle thinking for innovation technology, sustainable business and green growth as well as promoting best practices, programs, local initiatives and lessons learned on SCP related projects in Asia and the Pacific region. Though initially intended to selected papers from the two conferences only, further papers were invited even from outside.

The framework encompassing the ideas around which the papers in the Special Volume are based is presented in Fig. 1.

2. Summary of the manuscripts in this special volume

Based on the framework presented above in Fig. 1, the papers are divided into sub-categories as follows:

2.1. Technology for cleaner production

This section summarizes the papers in this special volume dealing with process optimization, supply chain management, product development and improvement towards environmental aspects and hence, cleaner production. The range of topics cover innovative product and process development.

Paper 1. Wang et al. (2016) described the development of clean coal technology which burns clean coal-biomass briquettes in a novel clean-burning coal stove. An environmental friendly burning stove was proposed which increased thermal efficiency and reduced emissions of sulfur dioxide, nitric oxide and carbon monoxide. The study demonstrated the high thermal efficiency and

environment-friendly profile of the newly designed coal stove and the coal biomass-briquettes which have great potential for improving regional and indoor air quality.

Paper 2. Lin and Pai's (2016) paper illustrated the development of evolutionary seasonal decomposition least square support vector regression to forecast monthly solar power output. The conclusion of this study can serve for the strategic forecasting of renewable energy particularly solar power in the future.

Paper 3. Achawangkul et al.'s (2016) paper described the evaluation of environmental impacts based on life cycle thinking from the utilization of fossil fuels, electricity and biomass producer gas in double-chambered crematories. The results from the article could promote the benefit of biomass energy particularly from an environmental point of view.

Paper 4. Su et al. (2016) described the improvement of sustainable supply chain management using a novel hierarchical Grey-DEMATEL approach. The study revealed that practising 3R (reduce, reuse, recycle) can increase material savings, which is a top criterion for supplier selection.

Paper 5. A case study on schedule risk in prefabrication housing production in Hong Kong was proposed by Li et al. (2016). The social network analysis was applied to investigate the underlying network of stakeholder-critical risk factors in prefabrication housing construction projects. The results provided an effective method to analyze stakeholder-associated risk factors and evaluate the effect of these risk factors from a network perspective.

Paper 6. In a case study from Finland, the efficient use and recycling of resources by utilizing nutrients of waste water and carbon dioxide from flue gases via algae cultivation were compared with a conventional small scale waste water treatment plant (Manninen et al., 2016). Algae were effective in nutrient removal and the production of methane from algal biomass led to a net energy ratio higher than one.

Paper 7. The mechanism of adsorption of Congo red, representing an anionic azo dye, on carbonized leonardite, a low-rank coal, was studied by Ausavasukhi et al. (2016). The absorption kinetics and isotherms of the carbonized leonardite were identified which would help model the adsorption process of Congo red. Thermodynamic investigations showed that the adsorption process

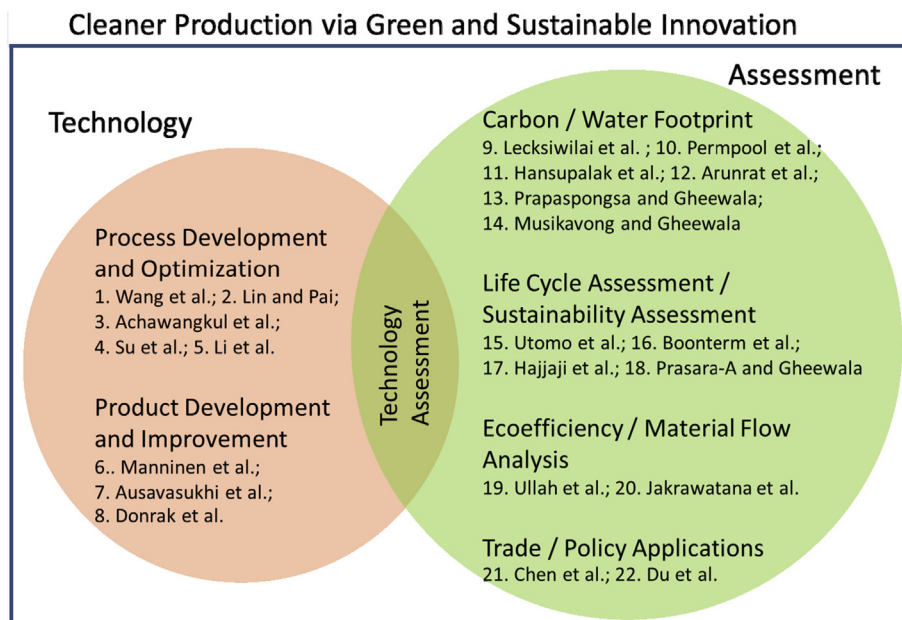


Fig. 1. Framework covering the topics of the papers included in this special volume.

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