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Critical Material Management for Sustainable Transition

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The world is promoting a grand sustainable transition for the well-being of people and planet, which is heavily dependent on the sustainable supply of various minerals or materials. Critical materials are the group of materials such as rare earth elements, cobalt, indium that are vital to emerging technologies for the global sustainable transition (Graedel et al., 2015). Due to the huge imbalance between supply and demand, the critical materials are widely treated as “strategic and conflict” materials that could arise potential global competitions. In this context, how to enhance collaboration between various stakeholders in critical material management along its global supply chain becomes extremely important.

Obviously, a more transparent global supply chain of critical materials plays as a basis for critical material management and collaboration (Jin et al., 2016). Prior studies are mainly focusing on the material criticality evaluation and screening (e.g. Yale Metals Criticality Project (Graedel et al., 2015), EU Critical Raw Materials (CRMs) Project (European Commission, 2017)). Quantitative methods (i.e. material flow analysis, input-output model) are of great importance to deepening our understanding of material use, circularity, and efficiency. However, compared to other materials, the regional and global studies on the full and dynamic material flow analysis of critical materials are relatively limited, especially on the looking-forward analysis of critical material driven by emerging technologies in renewable energy, electric vehicles, and others. Besides, there is also a lack of comprehensive and in-depth estimation on the resource availability and production capacity of critical material supply (Mudd et al., 2019). Furthermore, more studies on the global trade network of critical material and its impact on material criticality are needed. The emerging information technologies such as Big data can also facilitate such transparent effort in today's digital world.

The role of critical materials in regional and global sustainable transition should be better understood. As indicated by some studies (Koning et al., 2018), the sustainable transition will face severe constraints from critical materials. Hence, it becomes increasingly

important to integrate the critical materials into regional and global sustainable transition policymaking and to identify the strategies to mitigate such impact from critical materials, especially from the full supply chain perspective. In particular, the studies on mining activities, product design, demand projection, stock accumulation, end-of-life treatments, and the associated environmental impacts of critical materials along with the regional and global transition in energy and other systems is urgently required.

The main objective of this Virtual Special Issue (VSI) in *Resources, Conservation, and Recycling* is to gather a comprehensive set of articles from multiple disciplines such as industrial ecology, circular economy, life cycle engineering, supply chain management, and environmental engineering in promoting sustainable critical material management and cooperation for the regional and global sustainable transition. We invite the submissions of the novel and original papers that report new empirical findings as well as review articles that integrate existing bodies of research and provide new insights on, but not limited to, the following directions:

- Comprehensive analysis and quantification of national, regional and global critical material stocks, flows, and losses (in particular looking-forward material flow analysis)
- Exploring the linkage of critical material with the regional and global sustainable transition
- Global cooperation, national policies, strategies analysis, and industrial practices for material criticality mitigation along its global supply chain
- Environmental assessment of critical material production, manufacturing, use, and recycling
- Assessment on the resource availability from the primary and secondary critical material supply
- Dynamic material criticality evaluation and assessment
- Analysis of critical material trade network and its impact on input-output economics

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¹ Managing Guest Editor.

- Big data-driven critical material assessment, management, and decision making
- Case studies on critical material in daily and emerging technologies

1. Manuscript Preparation and Submission

A Virtual Special Issue (VSI) is an online-only grouping of Special Issue articles traditionally assigned to a single Special Issue. The articles in a VSI will be assigned a unique identifier and published in a regular journal issue. The unique identifier allows to simultaneously adding the article to a VSI in ScienceDirect.com. Articles grouped together in a VSI retain their original citation details. A VSI speeds up the publication of individual articles as, unlike the publication process for conventional Special Issue articles, a VSI does not need to wait for the final article to be ready before publication.

A detailed submission guideline is available as “Guide for Authors” at: <http://www.journals.elsevier.com/resources-conservation-and-recycling>. All manuscripts and any supplementary material should be submitted through Elsevier Editorial System (<http://ees.elsevier.com/recycl>). The authors must select “SI: Critical” in the submission process.

2. Important Dates

- Full paper submission deadline: September 20, 2019
- Final decision notification: October 31, 2019
- Publication: As soon as accepted (VSI)

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