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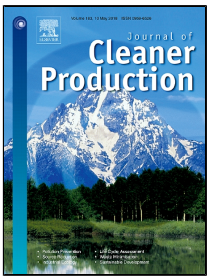

Life Cycle Assessment of Asphalt Pavement Recycling for Greenhouse Gas Emission with Temporal Aspect

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Life Cycle Assessment of Asphalt Pavement Recycling for Greenhouse Gas Emission with Temporal Aspect

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Abstract:
This paper quantifies greenhouse gas emission of asphalt pavements containing reclaimed asphalt pavement using life cycle assessment with temporal aspect. The life cycle stages include raw material acquisition, plant production, construction, maintenance, and end-of-life. The time-dependent decay function of carbon dioxide was adopted to capture time effect in life-cycle inventory assessment. The case study of runway rehabilitation demonstrates that four critical factors may affect environmental impact of pavement recycling, including recycled material content, blending efficiency of virgin and recycled binder, moisture content of recycled aggregate, and pavement performance levels. As recycled material content increases, the reduction of greenhouse gas emission increases accordingly. However, the benefits of raw material saving can be compensated by the increased moisture content of recycled aggregate and the shorter life of pavement with reclaimed asphalt pavement. As the moisture content of recycled aggregate increases, the performance of recycled asphalt pavement need reach a higher level in order to avoid environmental burden. On the other hand, the results indicate that the environmental impact of asphalt pavement recycling is overestimated if temporal aspect is not considered. This finding reinforces the importance of physical decay pattern of greenhouse gas emissions along time in life cycle assessment for global warming potential.

Keywords:
Life cycle assessment; reclaimed asphalt pavement; greenhouse gas emission; temporal aspect