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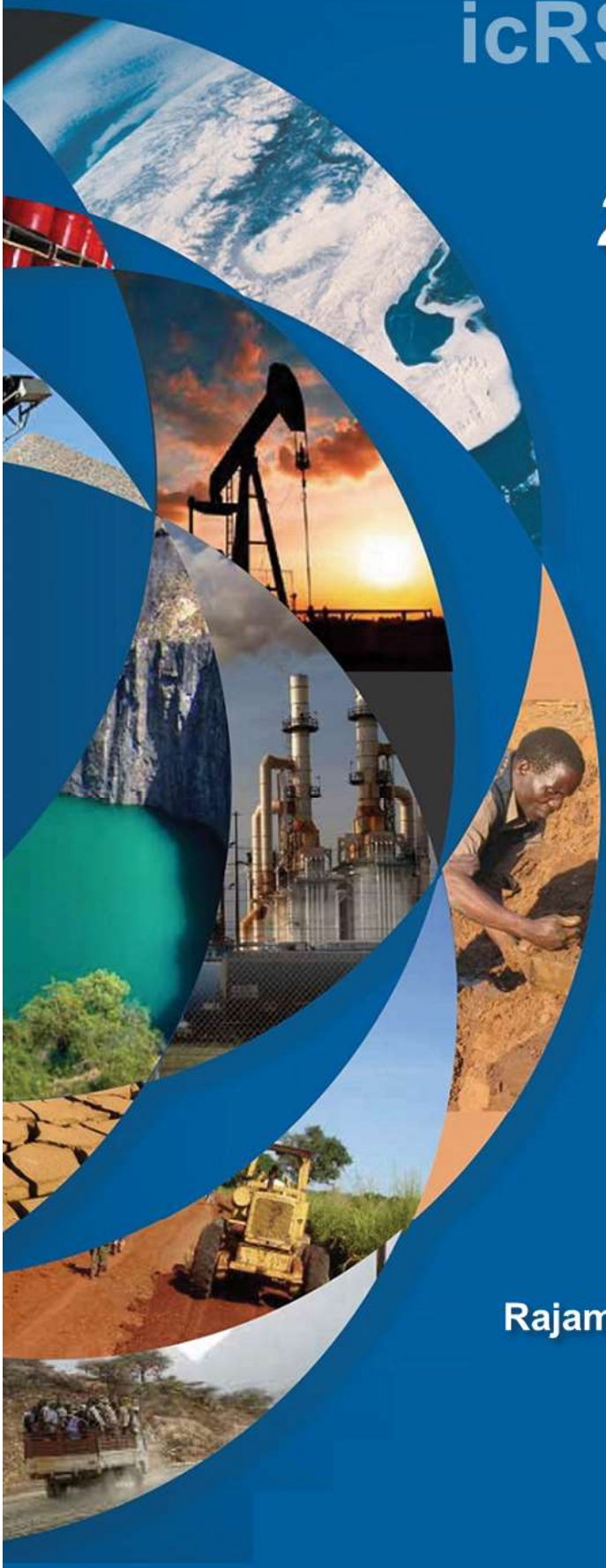

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Footprint analysis of circular economy practices in the steel industry

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Abstract:

Steel is one of the dominant materials in the building industry, however, substantial environmental impacts occur in its supply chain. We evaluate the environmental performance of different steel production scenarios at the macro level, taking into account circular economy practices. Using the dynamic life cycle assessment methodology, different scenarios are assessed for the time horizon 2015 to 2070. The environmental footprints are quantified in terms of primary energy, greenhouse gas (GHG) emissions, material, land and water footprints. Forecasts regarding the availability of end-of-life steel and future demand in European and global contexts are considered. The analysis shows potential savings across all impact indicators except for the water footprint. This is because of the projected increased use of electric arc furnaces compared to blast furnaces, leading to increased electric energy demand supplied from hydropower. Within Europe, sufficient supply of end-of-life steel is possible from 2043 on, but complete electrification of the production route, away from fossil fuels, might not be possible until 2070, due to increased demand. Moreover, blast furnace-based steel production assets are relatively new (e.g., average age is 13 years), and therefore, might not be discarded before the end of their useful service life, usually 40 to 50 years. As a result, the emissions associated with these assets could be considered as ‘locked-in’. Accordingly, global steel production is associated with significantly increased environmental impacts.