Implementing Circular Economy Principles in Economic Activity Areas in Luxembourg

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Due to the limited territory of Luxembourg and its spatial master plan dedicating 600 Ha more land to economic activity areas (EAA), it is of utmost importance to address impacts on neighbors and the environment, such as air or water emissions, noise and traffic. Recently, several big industrial development projects have also raised questions about the distribution of limited resources, namely water (Padiou, 2018). In 2014, the Luxemburgish Government commissioned the study "Luxembourg as a knowledge capital and testing ground for circular economy", which served as a blueprint for subsequent initiatives to activate the potential socio-economic benefits identified by the study (Hansen et al., 2014). In 2016 the Ministry of Economy commissioned a follow-up study focusing on EAA.

This paper describes the results. It presents tools and methods for developing EAA according to the principles of the circular economy (CE). The objectives of the study included analysis of the major material and energy stocks and flows, generated by the extension of an existing EAA Eselborn-Lentzweiler in Northern Luxembourg (Schosseler et al., 2017). The scope of the study included industrial symbiosis at the meso-scale (Ghisellini et al., 2016), but adopted a more holistic approach, based on Cradle to Cradle principles (McDonough and Braungart, 2002). For example, an EEA is designed and built in a modular way, so that residual value and materials health are improved, and the land can be returned to a greenfield at the end of the area's use phase or repurposed without any loss of quality. Material stocks and flows, used for infrastructure, equipment and production respect biological and technological cycles. Energy is renewable, with a focus on solar and geothermal in the present case. Particular attention is paid to the integration of the EAA into the natural, geographical and social ecosystems, aiming at the creation of positive impacts for the neighborhoods, e.g. biodiversity and quality of life, rather than the traditional minimization of negative impacts. This includes multifunctional facilities and sharing of services not only within the area, but also with neighboring villages.

The core of the methodology is a streamlined co-creation process, that involves multiple stakeholders, connected to the EAA at various stages, starting from the early planning. Every stage of the process is tied to a practical toolbox with qualitative and quantitative circular objectives for setting a roadmap that integrates the above-mentioned principles. Embedding this methodology into the legislative and regulatory framework for the planning and managing of the EAA is an important step. It provides not only security for companies, willing to adopt CE principles for their implementation in the area as well as their own activities but contributes to aligning economic objectives with environmental and social benefits, an aspect recognized as crucial for the contribution of the CE to a sustainable development (Murray et al., 2017). A strong involvement of public actors responsible for the development of the EAA, as well as realigning the sequence of their involvement are also key elements of the methodology. The approach is applicable to EAA beyond Luxembourg.

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