

Circular Economy and Material Flow Management: Two principles to enhance sustainable investments”

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1. Introduction to Circular Economy and Material Flow Management

Linear economy model rest on the foundation of easy accession to large volumes of natural resources and energy. Thus, it is characterized by high material and energy intensities, its reliance on economies of scale and intricate global logistics and supply chains. Typically, the bulk of the goods of consumer oriented linear economies become waste in a very short time. And that is only a fraction of the total emissions/waste generated throughout the process of creating the goods. Consequently, linear economies not only help rapidly deplete the natural resource base, but also accelerate the degradation of natural ecosystems such as water, air and land through its polluting emissions. And last but not least, linear economy systems are not designed to maximise the regional added value if all true and hidden costs are taken into account. A sustainable regional/national economy with a future oriented growth and investment strategy cannot be sustained indefinitely based on linear economies. Hence, the million-dollar question is: is there an alternative?

The answer could be found at the heart of biological systems, based on which the early economic models were founded on millennia before industrialization and globalization. The simple premise of the resource use of biological systems is that ‘whatever extracted from nature returns to nature to be recirculated indefinitely’. This principle saw the birthing of a phenomenon termed ‘Circular Economy (CE)’ in which, the localization and circularization of material and energy flows and maintaining modest productivity levels of economies helped maintain the natural resource utilization at a steady state.

This CE model is broadly characterised by a holistic and systemic thinking in material and energy flows striving to maximise the economic value of our actions while minimising negative impacts by closing material loops, activating renewable regional growth and energy potentials and ensuring participation of society.

Hence, CE model synergizes with the concepts of industrial symbiosis, cleaner production, eco-design, and sustainable consumption and production^{1,2}. IfaS’ approach to CE is broadly based on the principles of Material Flow Management (MFM), which is since 1994 official German environmental policy and defined as goal oriented, responsible, holistic and efficient optimization of material systems. It aids in resource-efficient, responsible handling of material and energy flows of a system, which essentially forms the foundation of CE.

¹www.ellenmacarthurfoundation.org

²Tan, Z (2008) Circular Economy & Renewable Resources in China www.eesc.europa.eu/resources

Regional MFM is a tool kit for the implementation of sustainable development e.g. the Circular Economy or Zero Emission (ZE) strategies on a regional scale including the important sectors such as industry, public, private household, agriculture, forestry and regional resource infrastructure (energy, waste, water).

In general, many regions and industries depend on imports of resources and goods; especially fossil energy carriers which then become the basis of many products. Therefore often only small added value can be generated within the region. Because of the payment for this consumption of goods and energy, most of the capital flows out of the region. On the basis of the energy flows, the following figure exemplifies the energetic and financial flows through the described system.

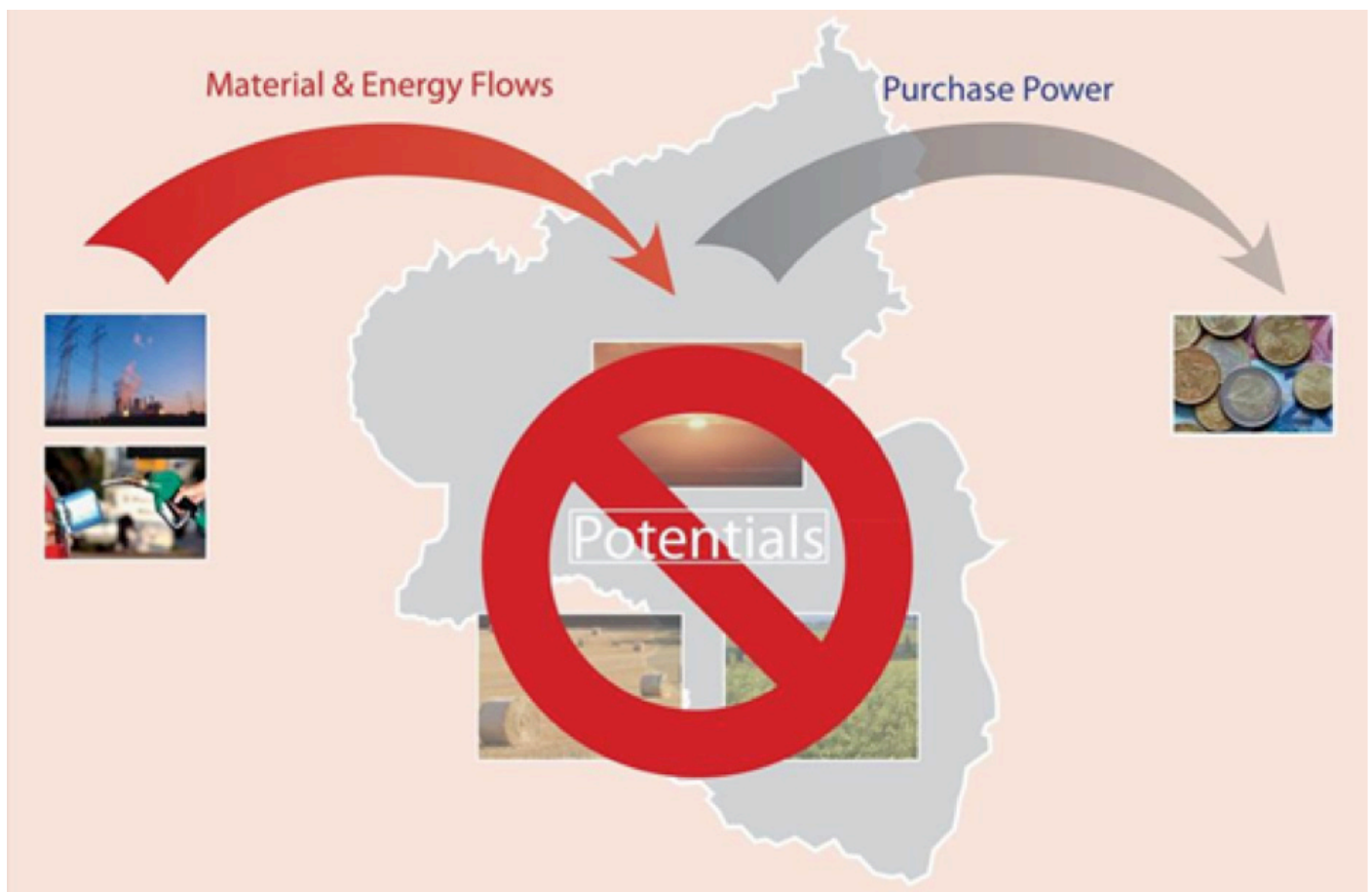


Figure 1: Linear System without MFM approach (Source: IfaS)

The detailed observation of the present state as well as the use of regional potentials is integral to meet the requirements of a Zero-Emission concept. The following figure demonstrates the situation within a region after the implementation of a Circular Economy and Zero-Emission based concept and the activation of regional added value throughout applied regional material flow management.

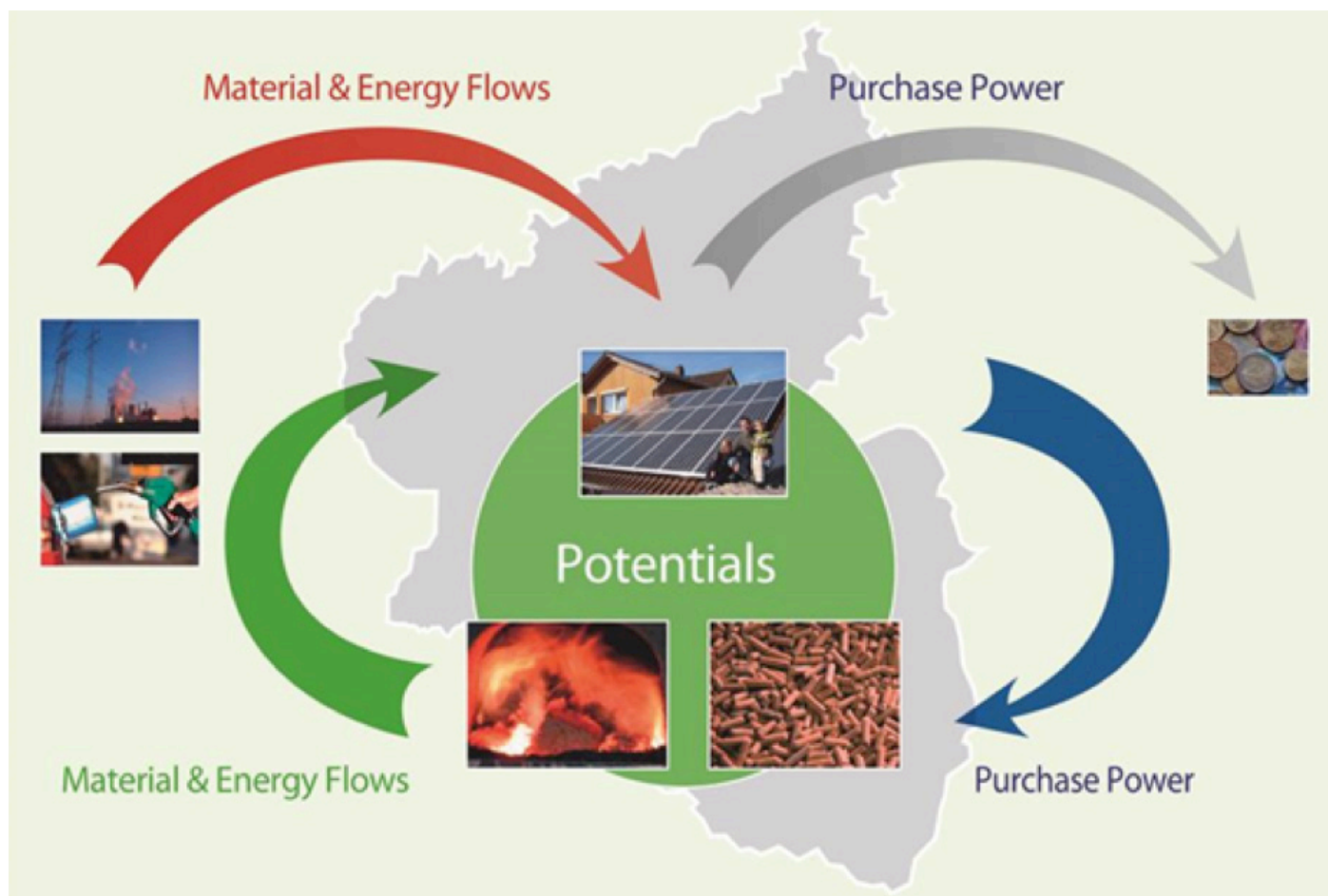


Figure 2: Circular Economy with MFM approach (Source IfaS)

Regional value creation is what drives the economy – and it is one of the pillars of the MFM approach. In a regional context, generated added value does not necessarily have to be in a monetary form only. It can include aspects such as protection and sustainable development of our cultural landscape, innovation, and image. And it means protection and enhancement of the quality of life as basic change of conditions (for example, under demographic change). When a region's material and energy streams are closed, the region's related financial streams remain within the region. The innovative technologies needed for using regional potential call for additional workforce capacities – often, highly qualified persons – and thus tie up capital. But with efficient management of regional material streams, products and services can usually be offered more reasonably, with no job losses and with higher capital in-flows. Savings resulting from reduced energy consumption, for example, directly benefit regional economic cycles.

MFM is thus much more than just a new approach in environmental and climate protection. MFM, and the related idea of a complete close-cycle economy, provide the basis for sustainable regional economic and industrial policies, and for promotion of innovation-related modernisation.

2. Examples of MFM Opportunities

Circular economy systems based on MFM principles offer manifold business opportunities, which can be turned with the right technology and management approach (accompanied by appropriate legal frameworks) into green investments with equity dividends for the investor and regional added value for the public.

Such business opportunities with societal co-benefits exist in nearly all sectors. A classical example is conventional waste management with non-separated waste collection and disposal at sanitary landfill sites. A solution, which seems to be environmentally sound at the first glance offers tremendous improvement and business potentials. Not only the recovery of secondary raw materials based on state of art recycling technologies but in particular the appropriate treatment of organic residues could transform a linear system into a closed loop economy. The treatment of organic residues in anaerobic digestion units produces biogas which could easily being upgraded into natural gas quality. The remaining substrate could be further process towards high quality organic fertilizer substituting mineral fertilizer and combating the loss of soil fertility, in particular in arid areas. The very same technology and even the same infrastructure could be used to co-digest organic municipal solid waste fractions and sewage sludge. The initial investment in such “BioEnergy and Resource Centre (BERC)” are a multiple of the ones associated with the construction of landfills. But they really could be considered to be investments because they are generating income due to the sales of their product. If the levelized cost of waste treatment services (reflecting the cost of capital plus the cost of operation per service unit) of high efficient circular systems are compared with true cost of landfilling (including the cost of up to 50 years aftercare) high-tec recycling and energy recovery structures are becoming extremely competitive. The sales of products such as energy, soil amendment, and secondary resources are creating value added tax, job opportunities and avoid negative externalities such as soil and air emissions.

Other examples are energy efficiencies strategies such as energy efficient lighting by LED, high efficient pumps in water sector, just to name a few. Regional renewable energy strategies, such as solar settlement planning, wind and solar catasters and biomass-to energy decrease the dependency on fossil fuels, create a long-term calculation basis for levelised costs of energy generations and offer plenty of job opportunities in planning, production and maintenance of new energy infrastructure.

Opportunities are vast. Sound planning is the key. Technologies are usually existing. Debt and equity capital are ready to move into profitable investments. The only thing required is a forward thinking and sound planning of the activation of regional growth potentials. Material Flow Management is an appropriate tool-kit for regional and national Circular Economy planning providing evidence that climate protection and economic growth are not only two sides of one coin but inevitably linked.