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THE CIRCULAR ECONOMY AND RECYCLING OF SECONDARY RAW MATERIALS

ABSTRACT

The circular economy is playing an increasingly important role in everyday economic life. The impact of the related methodology processes is growing more and more in everyday practice. The European Union also considers this theme important and the support of the related initiatives and the regulations in individuals countries. A number of directives, studies and international cooperation projects help to promote the realization of the circular economy. A significant part of the process is the recycling of secondary raw materials and the waste-free utilization of raw materials. The emergence of the concept of industrial symbiosis also greatly facilitates the processes. The methodologies of recycling secondary raw materials can also be observed in Western Transdanubia, such as biogas utilization from sewage sludge, wastewater treatment, wood waste reutilizations, recycling of rubber in rubber asphalt composites, energy and thermal utilization of wood waste, bark, and heating with sawdust in buildings.

Keywords: circular economy, industrial symbiosis, climate protection, recycling of secondary raw materials

INTRODUCTION

The circular economy is increasingly important as a key factor in the European Union today. In order to assess progress towards a more circular economy and the effectiveness of utilization in Hungary, it is important to have a set of reliable actions and research topics. The transition to a more circular economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste is minimized, is an essential contribution to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy. The opportunity to transform our economy and generate new and sustainable competitive advantages for Europe is relevant these days. The circular economy will boost the EU's competitiveness by protecting businesses against scarcity of

resources and volatile prices, helping to create new business opportunities and innovative, more efficient ways of producing and consuming. Recycling of secondary raw materials and the waste-free utilization of raw materials is a significant part of the process.

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Hungary does not yet have a specific plan for the promotion and support of industrial symbiosis and circular economy projects. Despite the fact that sustainable lifestyle and consumption was promoted in the 2007-2013 period, through the allocation of significant amounts of funding to local, regional and national campaigns and sample projects, sustainable development has been pursued systematically basically through the implementation of the EU 2020 Strategy aiming at intelligent, sustainable and inclusive growth in the form set out in the Partnership Agreement. The European Union Strategy aims to advance economic growth built on sustainable, high value added production and an extension of employment, and is based on the 2005 UN General Assembly resolution, confirming the 2000 Millennium Declaration, which identified three closely interrelated and interdependent dimensions of sustainable development: economic, social and environmental.

Hungary, the EU2020 Strategy is implemented through the interventions of Environment and Energy Efficiency Operational Program (EEEOP) that primarily aims to strengthen the environmental dimension of sustainability, yet, indirectly, to contribute to advancing economic growth as well. EEEOP includes policies and priorities that are very close to the goal of advancing industrial symbiosis, secondary raw material regulations and circular economy, especially with regards to the improvement of waste management and resource and energy efficiency policies in Hungary.

The development of a circular economy in Hungary is hindered by the lack of awareness of society. This is the reason why the awareness raising strategy of the EEEOP aims at large groups of society, and mostly the most receptive category, children, where the results can be actually measured in behavioral change.

Finally, in Hungary, the most important policies used to reduce the impact of constraining factors and to facilitate the development of industrial symbiosis, secondary raw material regulations and circular economy are the following:

EEEOP 3. Priority AXIS - 1. Measure: The development of separate collection and transport systems and EEEOP 3. Priority Axis - 2. Measure: The development of sub-systems in pre-treatment, recycling and disposal in terms of municipal waste.

The main target of the measure is to develop the existing separate waste collection system, increase its efficiency and reach in urban areas. More specifically, it aims to facilitate the utilization of municipal waste (paper, glass, plastic, biodegradable organic hazardous waste), to increase the separation of housing waste, and to establish appropriate collection points and recycling. It is also important to extract useful substances from municipal waste. The measure

supports the continued management of separately collected waste, the development of the necessary selection plants, as well as the establishment of complex waste management centers combining selection and biological and mechanical treatment.

Hungary needs to do the follow: establishment of waste collecting areas, increase the preparation prior to recycling, improve the sorting of collected waste, and use more of bio-waste. In the West-transdanubian Region there are many good examples of how the innovative companies have implemented the circular economy. For example, MOL and Pannon University developed a chemically stabilized rubber product with several years of research and development work, which in 2008 received a Technical Building License. With an annual capacity of 5,000 tonnes in Zalaegerszeg city, 150,000 tire crumbs have been reused, and 100-150 kilometres of pavement can be made with the finished rubber bitumen.

Also in this city, a biogas plant is located at the waste water treatment. The wastewater treatment plant treats approximately 50,000 – 60,000 m3 of surplus activated sludge generated on site and sewage sludge imported from other local wastewater treatment plants within a 30 km radius. Sewage sludge is available and biogas is also produced as by-product. Biogas is used primarily for electricity and heating but produces vehicle fuel as well, which has almost the same quality and energy content as natural gas, which is used by CNG (compressed natural gas) vehicles.

At the University of Sopron, Simonyi Károly Faculty of Engineering, Wood Sciences, Natural Resources Research Centre there are many research studies in connection biowaste reutilization. Natural raw materials have been used for centuries. Of raw materials, wood and its bark have outstanding significance because of their special chemical components and unusual structure. Annual bark production is estimated to be between 300 and 400 million m^3. The bark of different tree species has been used extensively in or in conjunction with modern technologies. The diversity of bark utilization derives from the variety of the bark of different species and from the possibilities encoded in the material.

Due to its low strength and inhomogeneous appearance after it is separated from wood, bark cannot or only to a very limited extent can be utilized. In the course of bark research, we aimed to broaden the utilization possibilities of the bark. One new method of recovery is to use bark as a thermal insulation material. The basic idea came from nature, as the bark protects the trunk of the tree from minor forest or bush fires. The bark not only provides mechanical and thermal protection for the wood, but also protects it against biological pests. To this end, it contains nanoparticles of compounds that inhibit the establishment and spread of biological pests.

This bark potential depends on processing biomass and bio-waste for different end-uses, The pine bark is suitable for thermal insulation boards, which have relatively low coefficients of thermal conductivity (0.064-0.074 W/mK). Moreover, the boards can be glued with tannin resin, free from formaldehydes and artificial resins, so it is more environmentally friendly. Sopron University is still in investigating thermal insulation panels made of black locust tree bark. The utilization of large amounts of bark coming from the timber harvesting process.

In another type of research, the Natural Resources Research Centre wanted to utilize the very large amount of sawdust waste as a raw material. During wood processing, wood particles are separated during almost all machining but their use is very limited. It is sometimes used as part of composition boards, as a filler in brick production and a trivial amount is burned for heating.

CONCLUSIONS

The transition to a circular economy is a systemic change. In addition to targeted actions affecting each phase of the value chain and key sectors, it is necessary to create the conditions under which a circular economy can flourish and resources can be mobilized. Innovation will play a key part in this systemic change. In order to rethink our ways of producing and consuming, and to transform waste into high value-added products, we will need new technologies, processes, services and business models which will shape the future of our economy and society. Hence, support of research and innovation will be a major factor in encouraging the transition; it will also contribute to the competitiveness and modernization of industry in the EU.

Bio-based materials, biological resources, such as wood, bark, crops or fibers can be used for a wide range of products, construction, furniture, paper, food, textile, chemicals, etc. and energy production. The bioeconomy provides alternatives to fossil-based products and energy, and can contribute to the circular economy. Bio-based materials also has advantages linked to their renewability and biodegradability. On the other hand, using biological resources requires attention to their life cycle environmental impacts and sustainable sourcing. The multiple possibilities for their use can also generate competition for them.

National measures such as extended producer responsibility schemes for separate collection of wood can have a positive impact. The European Commission will work on identifying and sharing best practices in this sector and promote innovation; the revised legislative proposals on waste also include a mandatory target on recycling wood packaging waste and will promote synergies with the circular economy when examining the sustainability of bioenergy. The bio-based sector has also shown its potential for innovation in bio-waste reutilization, and new processes, which can be an integral part of the circular economy.

Bark utilization research has economic results, some of which are of international significance. These include a thermal insulation board made from bark, which produces an environmentally friendly product from current waste that can replace other non-environmentally friendly products (polystyrene, mineral wool). The other product is a thermal insulation board made from sawdust by a hydro fiber methodology. In this case, no chemicals are required to produce it and it does not contain an adhesive, although it has significant strength. Hydrogen bridges on cellulose chains are utilized as a binder “material”. Due to their environmental availability, the above products may also be of social significance.

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