



THE CONCEPT OF CIRCLED ECONOMY AS A COMPETITIVENESS FACTOR: MACRO-ECONOMIC ASPECT

Valentinas Navickas, Akvilė Feiferytė, Mantas Švažas
Kaunas University of Technology

Annotation

The rapid dispersion of the idea of circled economy is determined by the need for suitable and effective management of waste and resources. Today's manufacturing processes are ineffective and wasteful; they use too much primary raw materials and do not recycle used products. Circular economy is only now receiving more attention from scientists, after European Commission published a communication „Towards a circular economy: A zero waste programme for Europe“. The object of circular economy is waste recycling, using it as materials for manufacturing or energy production. Due to the rapid growth of the economy over the recent decades, technologies, population migration from rural areas to urban, growing quality of life, amounts of waste are significantly increasing and becoming a serious ecological disaster in some heavily polluted areas. The international environmental agencies analyse negative impact of waste, focusing on pollution reduction and need of efficient recycling. Today, European countries with European Commission, implement zero waste policies, aiming to improve waste management and recycling efficiency. Zero waste policy is understood by scientists as unrealistic and unreachable goal in today's economy, but it works as a preventive measure to encourage countries to implement effective waste management and recycling policy. This situation leads to a growing interest among scientists concerning waste management opportunities and innovative technologies integration to ensure sustainable development while maintaining economic growth and the saving of natural resources. Circular economy implementation involves waste collection, transportation and recycling processes. Industry of waste management plays an important role not just in circular economy, but in helping to move away from linear production to efficient resources management for manufacturing and energy production sectors as a supplier as well.

KEY WORDS: circled economy; competitiveness; macro – economic factors; value chain; waste economy.

Introduction

Today's world confronts waste crisis because of ineffective manufacturing, where materials are used inefficiently and the by-products are not recycled. Strategies for dealing with the global waste crisis focus on improving industrial waste management policies, prevention and minimization, source reduction, better waste treatment and enhancement of recycling opportunities (Clapp 2010). The idea of circled economy is widely spreading around the world, together with its goal of promoting proper waste and resource management. The theme of circular economy was not extensively analysed by scientists, it is still on the rhetorical level. Scientists and international organizations are taking first steps to define the concept of circular economy, its importance to economic development and its prospects for implementation. Latest scientific publications only encourage the search for ways to put into practice the use of waste as one of the potential sources of raw materials.

Supporters of circled economy emphasize the use of waste as raw materials before it becomes final waste. It allows the use of waste in production, processing it into raw materials or energy. This economic model does not recycle waste in the traditional ways. Although recycling is the key of this model, it is related to recovery of resources, efficiency of resources, sustainable consumption and production, effective supply of raw materials, industrial symbiosis, zero waste implementation, eco-design, waste prevention and minimization, social responsibility (Velis, Wilson 2014).

The concept of circular economy is best described in European Commission published communication „Towards a circular economy: A zero waste programme for Europe“ in 2014. This document defines further waste management policies across Europe and includes the areas of economy such as manufacturing and marketing. Although China implemented circular economy in 2008, it is based on the 3R – Reduce, Reuse and Recycle. The European Union understands circular economy as one more tool to ensure economic growth of the Union, improving its stability and prosperity. The circular economy is the sequel of sustainable development and bio-economy, which cover the specific areas of waste recycling to resources or energy; thus, strengthening the industrial sector. Circular economy can improve the country's competitiveness through manufacturing optimization, composting, and renewable energy production.

The question arises: how to cover the collection, transportation and recycling processes of waste to replace primary resources?

Today's society is faced with several essential problems: rapidly depleting natural resources, environmental pollution, and energy crisis. All these problems are closely linked and are conditioned by each other. It is necessary to implement integrated solutions that help to solve several problems at once.

The waste is considered to be renewable resource, the amount of which directly depends on the change of the habits of population, standards of living, and the implementation of public policies. In recent years, growing population has been generating even more

waste. It needs to be managed effectively. Waste burning or burial in landfills is no longer an effective solution. It is necessary to look out for new waste management solutions to profit economically and environmentally. Economically developed countries which generate most waste can ensure effective transportation, disposal from landfills, recycling and reuse in manufacturing.

The goal of the study is to investigate the competitive factors of circular economy in the macro – economical aspect.

The concept of circular economy

The definition of circular economy was formulated and used by environmental scientists in 1970. So why, then, does the circular economy matter? At the global level, resource use has continued to grow rapidly in the past few decades. Still, waste recycling policy is not effective and about 50 per cent of waste still goes to landfills. Another reason is “weak” ecological modernization policy frameworks, as well as insufficient intervention in post-industrial countries. This started being critiqued as ineffective at addressing the core causes of environmental unsustainability (Hobson 2015). Circular economy means the transition from linear economy to a circular one. This model keeps resources in circulation for as long as possible.

Circular economy includes production and consumption sectors in order to reduce the amounts of waste generated, increasing the amount the amount collected and recycled at the same time. The idea of “Circular economy” is rapidly entering the world of

wastes and resources management discourse, becoming a mainstream concept on the rhetorical level. According to technological development in the industrial sector, waste recycling helps to improve production efficiency, reduce the quantities of primary raw materials used (Preston 2012). In his research paper, Velis (2015) defines circular economy as the returning of used resources that would otherwise become waste back into the economy. Today, the implementation of circular economy in the industry sector is an important waste management process, which will help ensure efficiency.

In 2014, when the European Commission published its communication „Towards a Circular Economy: A Zero Waste Programme for Europe“, scientists started to analyze circular economy’s implementation possibilities (Hobson 2015).

Since the industrial revolution, global industrial activity was based on a linear approach: collect, produce, consume, and discard. This means that in recent decades, non-recycling waste quantities have grown rapidly. In recent years, the European Union seeks to reform the economy in order to encourage more efficient use of natural resources and reduce environmental pollution, which would result in the purchase of less raw materials and more efficient use of secondary resources extracted from outdated and no longer used products. European Commission developed and proposed a circular economy model in 2014 (Fig 1). Its’ main objective – to keep product added value as long as possible, avoiding waste formation (Ragelienė 2014).

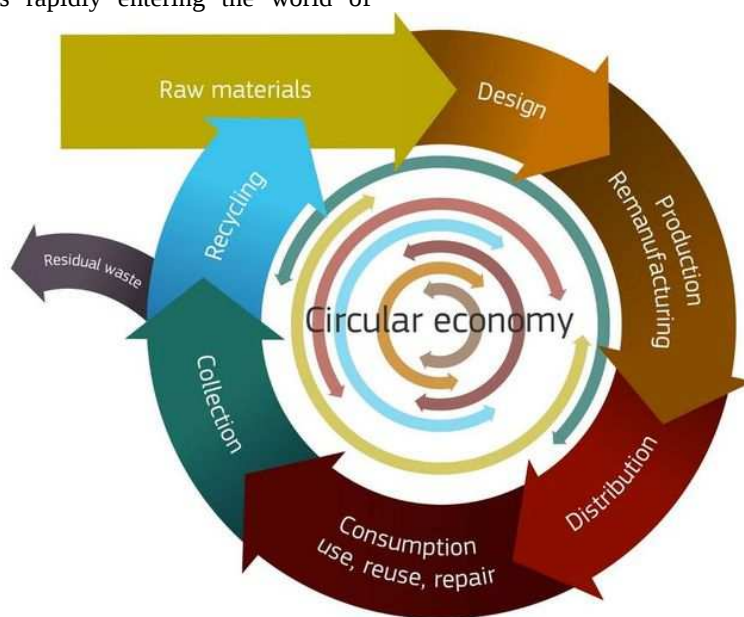


Fig. 1. Model of circular economy (Europos Komisija 2014)

All waste generated during manufacturing and consumption is recyclable, creating new products and raw materials. This model justifies only final waste that cannot be recycled or used elsewhere.

Each stage of this model makes it possible to reduce costs and dependence on natural resources, stimulate production and reduction of waste, as well as the

generation of harmful substance emissions. Circular economy contributes to sustainable development goals through production efficiency, more efficient use of raw materials, recycling, and waste reduction.

Circular economy requires changes throughout the entire production chain from product design to consumption. This also leads to new business models for waste as a raw materials, as well as new methods to

evaluate these matters and research consumer behaviour. However, the circular economy cannot completely eliminate the linear economic features, since the need to acquire primary raw materials and dispose of the final waste remains (Andersen M. S. 2007).

The implementation of circular economy become an important objective in the mission to ensure the efficiency of waste management. This change occurred when politicians and businessmen understood that increasing global competition for access to natural resources for an affordable price is becoming more and more difficult. In this context, profits for domestic economies and corporations are huge.

European Commission landmark communication for Parliament, Commission and European Economic and Social Committee and Regional Committee entitled "Towards a Circular Economy: A Zero Waste Programme for Europe", published in 2014, emphasizes that circular economy systems should maintain product's added value for as long as possible, while avoiding the generation of waste. This means that the waste produced in circular economy can be efficiently used further on creating additional value. The repeated use of a primary resource and its by-products limits the amount of waste and reduces dependency on unreliable supply, increasing the economy's resilience and competitiveness.

Circular economy is considered to be one of the main tools available to ensure economic efficiency, reduce natural resource usage, ensure efficient recycling, and pollution reduction, alleviating the considerable costs found in manufacturing sector and solving problems that are found when manufacturing linearly.

Economic competitiveness factors

Scientists pay attention to economic competitiveness (Porter 1980, 1985, 1990, Snieška 2008 etc.). The popularity of macro-level national competitiveness has grown because of globalization, economic integration and rapid development of information technologies. Scientists' articles do not have a common approach to competitiveness, because of its complexity and can be measured according to several parameters. Scientists analyse competitiveness in levels of the state, city, industry, company, product, or service (Beniušienė, Svirskienė 2008).

The country's competitiveness, in many research sources, has been described as a national interest; its main objective is to raise the income of the country's habitants.

Analysing country's competitiveness, comparative analysis helps to assess the country's position in relation to other countries. It is important to identify the object and factors which characterize it.

When identifying characterizing competitiveness factors, scientists prefer to use Porter "diamond model" (Fig. 2). According to Porter (1990), "diamond model" competitiveness is perceived as the country's ability to create an environment to help business grow and innovate faster than foreign countries. Porter expanded the concept of competitiveness, which includes a number of factors, distinguishing productivity as a key factor to the success of the state (National Competitiveness Council). Circular economy helps improve industrial sector's productivity and economic growth and leads to state-level macro-economic competitiveness. This means that circular economy can be identified as one of the competitiveness factors.

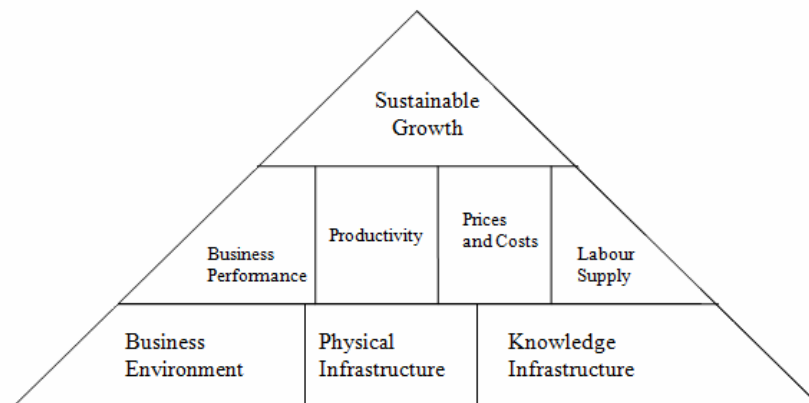


Fig. 2. Competitiveness pyramid

Sustainable growth of living standards is the guarantee of competitiveness on the top of the pyramid. Lower level contains essential conditions for the competitiveness of business results (trade and investment), output, prices and costs as well as labour supply. These factors are considered as state competitiveness factors. The lowest level of the pyramid covers policy contribution which includes three key areas for future competitiveness: business environment (tax

policy, regulation, financial and social capital), physical environment (energy, transport, information technology, real estate etc.) and knowledge infrastructure (scientist research, education, skills, training etc.).

Every year, the World Economic Forum presents the Global Competitiveness Index, which includes various factors' averages. The Competitiveness index component is divided into 12 economic competitiveness factors that helps to assess countries' competitiveness. In 2014-2015, the Global Competitiveness Report emphasized

innovation and skills as main economic growth factors (The Global Competitiveness Report 2014-2015).

The Factors are grouped and combined into the main determinant of competitiveness clusters in the Global Competitiveness Index Report like this:

1. Political stability, implementation of laws, effective legal framework, transparency in government activities;
2. Infrastructure: transportation development, education, accessibility and quality of services;
3. Macro-economic stability, fiscal and monetary policy, public finances;
4. Social environment: public health, quality of health care, social welfare, renewable energy, environmental situation;
5. Education: primary and higher education, higher education, personnel training;
6. Finance market: banks and stock markets, availability and reliability;
7. Technological improvement: innovations, information and telecommunication technologies availability and using;
8. Labour market: labour market efficiency and flexibility, legal regulation of labour, productivity;
9. Market size: scale economy, market openness, export, import;

10. Business modernization: business and science partnership, clusters, effective production.

According to Porter (1998), the states' well-being is created by its economic activities. State's ability to effectively utilize its available natural, technological, infrastructural, human, social and other resources is important for state competitiveness.

Value chain in the circular economy

Value chain can be defined as the set of activities required to design, procure, produce, market, distribute, and service a product or service (Emblemsvåg, J. 2003). M. Porter's value chain can be used for circular economy implementation. Porter's model has five main activities that create direct value. These are internal logistics, production, external logistics, marketing and sales, services. There are also four complementary activities that complement the value-creation process: organizational infrastructure, human resources, technological development and resourcing (D'heur 2015).

Value chain management (Fig. 3) helps integrate manufacturing, transportation and demand processes, ensure suitable waste recycling and use. Value chain management is defined as processes' integration between the supplier and the consumer. Added value is created when a product moves in the value chain (Sližienė, Zaukas 2013, p. 59).

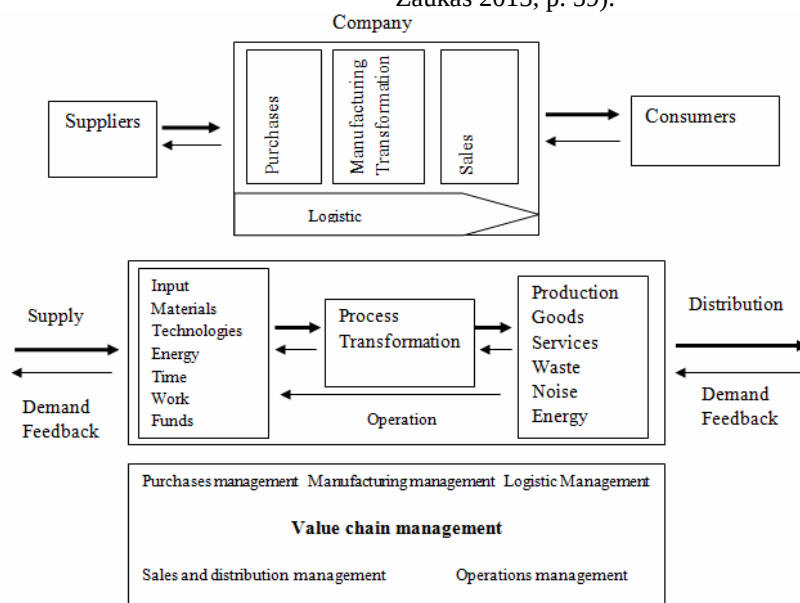


Fig. 3. Value chain management (Sližienė, Zaukas 2013)

Value chain costs must be related to customer value perception. The implementation of circular economy contributes to increased production efficiency, recycling and reuse of waste to ensure higher product quality and lower costs.

One of the main driving forces of economic development is the manufacturing sector. Continual technological development of manufacturing helps to reduce costs and improve the quality of products and services. Improvement is usually seen within the value chain as a value-added activity. Value is often regarded as profits or productivity (Wang, K. et al. 2006).

The waste management process also has inputs and outputs. The inputs are raw materials (natural resources) and energy, while outputs are useful products or waste. Fig. 4 shows the environmental aspects of the product realization link of the value chain based on theoretical assumptions. Waste, raw materials and semi-finished products are understood as costs in the value added process and they are necessary in manufacturing. Products, semi-finished products, or waste are thought to be the output at the end of manufacturing. They will be used for recycling or other manufacturing processes.

Waste that cannot be recycled or used anywhere else is considered to be final waste (Emblemsvåg, Bras 2001).

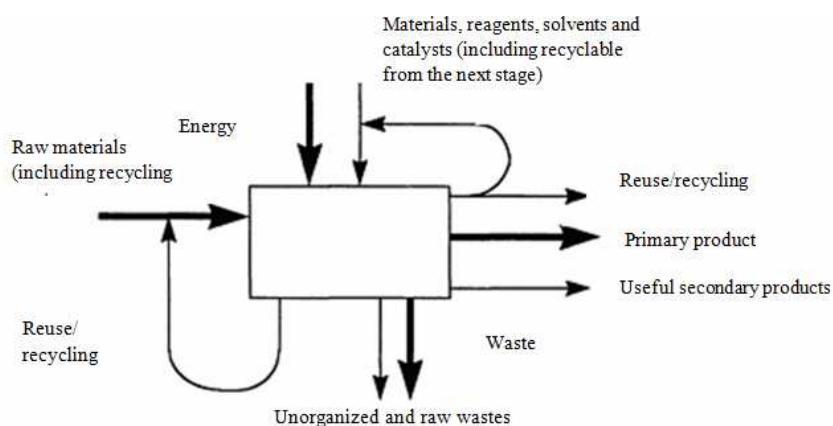


Fig. 4. Relation between environmental aspects and product realization (Emblemsvåg, Bras, 2001)

According to the Porter, the value chain is related to the value-creation process – from raw materials production to end-use products and services. Based on this definition, value added chain does not include the dismissal, recycling or reuse. Circular manufacturing can be included in the value chain. Value chain is based on today's cost control principles. These principles should be used while implementing environmental goals and programmes. Given the environmental and value chain principles, we do not know what impact to environment suppliers have. In today's society, environmental measures such as energy consumption and waste is understood as a cost rather than potential income (Emblemsvåg, Bras 2001). Waste is a considerable resource and the final product in the value chain. Waste can be recycled in other manufacturing processes to become a raw material again. Because of the possible reuse its constant renewal possibilities, waste occupies an important place in the process of generating added value.

Circular economy possibilities

Waste is considered as a renewable resource and its quantity continuously grows every year. Waste recycling and manufacturing possibilities are not fulfilled. Our society starts to realize waste's negative impact to the environment and starts looking to wastes as one of the manufacturing or energy production resources. It helps to deal with a few problems: to reduce pollution, recycle waste, improve renewable resource use, implement innovations in manufacturing, and ensure continuously growing economy.

Circular economy requires changes in all manufacturing processes: from product design to use. It also leads to new business models for the emergence of waste as a raw material, as well as consumer behaviour. In any case, circular economy cannot completely eliminate the linear manufacturing, since it still needs primary raw materials and generates final waste that still has to be disposed of.

Scientists have estimated that global implementation of the circular economy would bring about \$ 1 trillion of

real income in the world. UK circular economy would help to create a 3 billion pounds of GDB and over 50 thousand new jobs (Hayler J. 2014).

According to European Union experts' calculations, if existing resources were used efficiently in the whole production chain by 2030, the raw materials needed for production would be reduced by 17-24%. This would save around 630 billion euro per year and help to reduce the volume of waste (Europos Komisija 2013). Circular economy implementation is considered to be one of the sustainable development implementation tools, which would reduce environment pollution, the usage of primary natural resources, while also raising the state's economic and social well-being.

It was estimated that every year, in Europe, about 3000 million tons of waste is generated (Waste generation and management), one European generates about 481 kilos of waste every year (Waste: a problem or resource?). According European Environment Agency data in 2012, Lithuania generates about 469 kilos per capita of household waste, while in 2004 this number was lower and amounted to 373 kilos per capita. The continuously growing volume of waste, its removal and recycling becomes a problematic area in all states.

More and more waste is being recycled and less goes to landfills in Europe. Municipal solid waste recycling and composting has risen from 31% in 2004 to 41% in 2012. Although this is the high rate, analysis of individual countries shows big contrasts: for example, in Germany, Sweden and Switzerland municipal solid waste in landfills averages about 1-2%. Meanwhile in Croatia, Latvia and Malta, municipal solid waste in landfills averages around 90%. In Romania and Bulgaria this number goes up to 100%. Most of the countries with a low percentage of landfill has a high recycling, composting and energy production percentage – about 30% (Waste: a problem or resource?). States that do not recycle waste can export it. This helps improve state's economy and implement circular economy.

The best example of implementation of circular economy principles is San Francisco, CA, Sweden, and Norway.

San Francisco is considered to be one of the world leaders in recycling. While most of the United States overall recycling rate is low at only 34%, (Sweden needs more...). San Francisco has reached a 77% waste diversion recycling rate. This has been achieved through the implementation of an integrated three steps approach: waste reduction legislation implementation, cooperation with waste management companies, and the development of new recycling and composting programs, which promote recycling and composting culture creation through. San Francisco's „zero waste” recycling program has been implemented gradually since 1989. At that time, an integrated waste management act was adopted. Up to 1995, it helped to increase municipal solid waste recycling up to 25% and 50% up to 2002. During the last two decades of this policy being in effect the city's

administrative authorities have adopted a series of laws and decrees that have contributed to the promotion of recycling. The city has decided to implement a city-wide composting collection in 2001. A year later, in 2002, city has raised the objective to achieve 75 % waste recycling by 2012. Construction's demolition scrap recycling ordinance was released in 2006. In 2007, it was decided to reduce the waste generated by the food sector. In 2009, the city has made a decision on mandatory recycling and composting. In 2010, it was decided to reduce plastic bag consumption levels. During the whole decision-making period, recyclable waste volumes grew rapidly and it is double the US waste recycling rate (Fig. 5) (Gokaldas, V. 2012).

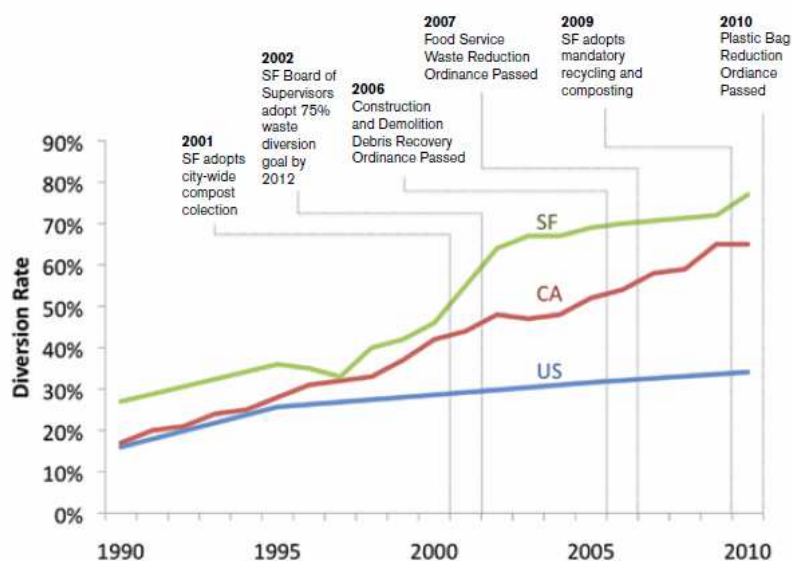


Fig. 5. San Francisco waste legislation and diversion rates (Gokaldas 2012)

San Francisco implemented an integrated waste management policy, which states that nutrition and vegetable waste is composted waste which is suitable for recycling. It is sorted and reprocessed. Other kinds of recycled waste is used for heat, electricity, or biofuels.

Integrated waste management policy has contributed to the new import and export trends popping up. Trade volume growth last year was very rapid. States specialization on the levels of economic sector activity on a national and regional level increase the volume of trade (Burinskienė 2014). Today, economically strong countries are characterized by high public focus on waste imports to meet recycling waste production needs. They also encourage countries incapable of recycling waste to export it to other countries.

The cases of Norway and Sweden are worth separate analysis because of their high imported waste percentage from other European countries. Norway and Sweden see a big potential in waste recycling. These countries' waste recycling rate is up to 99%. Every year, Europe still landfills almost 150 million tons waste. It is a huge number and an enormous potential business opportunity for countries with high waste recycling rates. Today, Norwegian and Swedish waste recycling companies are able to process larger quantities of waste than now, given

the potential to grow in the near future. Thanks to increased recycling opportunities, these countries can import waste as a raw material to fulfil their potential recycling and energy production potential. Sweden recycled over 550 thousand tons of imported waste in 2010. This number increased and in 2014, it recycled over 800 thousand tons of waste (Brow 2015). Sweden recycled over 2 million 270 thousand tons of waste in 2012 (Towards Zero Waste). Given the fact that European Union policy tends to work towards reducing the number of landfills and their complete abolishment, the potential recycling industry growth rates are high. At this moment, Oslo recycles over 410 thousand tons of waste per year, of which, 45 thousand tons of waste is imported from the United Kingdom. This is useful for countries which find it cheaper to export waste to Norway and pay for their recycling than to maintain their landfills (Russell 2013). These Scandinavian countries fully exploit their possibilities in energy production, waste recycling and composting.

Conclusions

Circular economy helps to improve manufacturing productivity and ensure continual economic growing. It is important to implement integrated waste management policy in the circular economy context because of waste crisis, low productivity and rapid exploitation of natural sources. Circular economy includes manufacturing and consumer sectors, systematically reduces emission of waste, and encourages waste recycling to raw materials, as well as energy production. Circular economy can increase the efficiency of the production scale.

Circular economy can be used as a tool for country's competitiveness. Porter's diamond pyramid helps to find ways to use sources more effectively. Innovations in the manufacturing sector can ensure high productivity and maintain principles of sustainability, reduce resource costs, help to create new jobs. Circular economy encourages the formation of business and physical environment, develops the knowledge infrastructure.

Porter's value chain helps to integrate production, transportation, and demand processes, ensuring proper waste processing and utilization. Waste is considered to be raw materials and final products which can be recycled in other production processes and became raw materials in the value chain. For their re-use and constant renewal, they occupy an important place in the value creation process.

Waste use as a raw material in manufacturing and energy production can resolve environmental issues and reduce the increasing amount of waste in the world. Countries that implement an effective waste collection, composting and recycling policy are faced with another problem – the lack of waste in their own countries. This problem birthed the need for waste trade. Countries with high waste recycling rates and production capacity, such as Norway, Sweden, Germany, and Switzerland, import waste from countries such as United Kingdom, Italy, and others, which find it financially convenient to export their waste.

States with high percentage of waste (Malta, Bulgaria, Romania and others) in landfills will specialize in waste export. Countries with a high rate of recycling will focus on waste import to meet their production and energy capacity.

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Valentinas Navickas. Doctor of social sciences (economics), professor at Kaunas University of Technology (Lithuania), the School of Economics and Business, the Department of Economics. E-mail: valna@ktu.lt Author of more than 280 scientific publications (including monography published in Czech Republic, 2013) and scientific articles, published in Lithuania and abroad. Author of four experimental development projects. Prepared 4 doctors of social (economics) science; now he is research adviser of 2 persons maintaining a doctor's thesis of social (economics) science. *Fields of scientific interest:* international economics, tourism economics, clusterization, competitiveness, customer satisfaction, corporate social responsibility.

Mantas Švažas. Kaunas University of Technology (Lithuania), the School of Economics and Business, the Department of Economics; Master. E-mail: mantas.svazas@gmail.com. *Fields of scientific interest:* competitiveness, clusterization, waste management, biomass clusters, energetic independence, rural development.

Akvilė Feiferytė. Kaunas University of Technology (Lithuania), the School of Economics and Business, the Department of Economics; Master. E-mail: feiferyte@gmail.com. *Fields of scientific interest:* competitiveness, clusterization, circular economy, waste management, biomass clusters.