Circular economy as an answer to the challenge of improving the quality of life

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ABSTRACT

The poster is an attempt to presents the influence the idea of circular economy on improving the quality of life. On the poster the author presents the quality of life concept (understands as the element of sustainable development), as well as living standard idea, and the key assumption of circular economy: i.a. the 'take-make-waste' approach, characteristic of the linear model of economy, as well as 'reduce, reuse, recycle and recover' which is used in circular economy.

Thesis: *It seems that circular economy could have positive effect on increasing the quality of life, (especially due to the fact that environment aspects have it).*

Way of verification: The Author tried to verify this thesis by conducting a preliminary analysis with using available data (Human Development Index, Quality of Life index and Circular Economy index). The preliminary analysis of existing relation is based on linear regression model, which results state that there is a positive influence of circular economy on increasing quality of life.

Circular economy idea

Based on the Kirchherr et al. (2017) we can assumed, that **circular economy** is a description of *an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/ distribution and consumption processes.*

These activities are done on three levels: **micro**, **meso** and **macro** and aiming at **sustainable development** in such a way that should lead to ensure the benefits for current and future generations. All efforts taken by the actors in this process could have an impact on different **dimensions (pillars)** on which the concept **of sustainability development** is based: **society**, **environment** and **economy** (Diaz-Sarachaga et al. 2018).

Since the publication of Brundtland Report (1987) **the present and future needs are** presented as **equally important**. It means that taking each activity, aiming at meet the present needs, we should take into consideration the possibility of meet the needs of future generations. The first association refers to the natural resources, but it is very difficult to predict how the technology will develop and which resources we will need in the future. It seems more reasonable to take quality approach in this analysis. The main question in this case is not: *"which resources will we need?"* but: *"what level of quality of life we want to achieve?".*

Implementation of the circular economy approach

Implementation of circular economy concept based on using various business models. **Implementation the circular economy** approach into practice express by vide range of behaviour, starting from change the behaviours or habits in everyday life in the sphere of using the resources, through choosing proper materials or products and being aware of environmental consequences of our approach and ending on the implementation different business models into economy. **'Take-make-waste'** approach, which **is characteristic for the linear model of economy** try to be replaced by **'reduce, reuse, recycle and recover'** concept, which is used in **circular economy**.

In case of **linear economy**, all resources are used only once. It means that their economic potential or broader – utility for consumers – are finished together with ending of using of the products. But resources using to manufacture the products are still in them. In effect, in our wastes there are many resources that can be used once again and this possibility depends on the technology we can use.

In **circular economy** we use **"xR"** approach which means that depends on our activities the number of "R" increases. "R" means all taking efforts that have positive effect on environment: Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, Recover (Kirchner et al. 2017; Manickam and Duraisamy 2019).

Analyzed this issue from the point of view ensuring higher quality of life, the potential influence of each activity can be **direct** or **indirect**. It means that, **chosen activities affect on increase of the quality of life in short or long time**. Observed effects depend inter alia on the complexity of the business (production) system. Single effort taken by us, or complex actions taken by one person, are not effective. Only common, continuous effort for better future will be effective and will have a sense.

Table 1. Different circular actions applied on different phase of the product lifecycle by the single user that have direct impact on quality of life

Stage	Action (strategy)	Description
Production	Circular design	Including design for long life or life extension, for biological cycle (separable biological and technical components, safe materials, materials can return to nature), for resource conservation.
	Long-life model or performance model	Products remain with their owners for a long time, through maintenance, product attachment and upgrade or paying for its use/access without formal ownership.
	Sufficiency model and substitution	Reducing absolute demand of resources by influencing and mitigating consumerism behaviour and eliminating the need of a product by a radical innovation or providing it in a different way (e.g. de-materialization, shifting physical products, services or processes to virtual ones).
Consumption	Sharing platform	Facilitate a user-user interaction in the form of, physical or virtual, platforms markets
	Incentivised Revenue Model	Use a revenue model that incentivises users (and all the actors involved), to take actions to achieve circularity (ex. selling, servicing the products, etc.)
	Circular criteria during purchase	Use the circular criteria during purchase.
Recovery	Reverse logistic	A logistics plan aimed to take back (supplier's own) or collect (other suppliers) products, components or materials.
	Next-life sales and cascading	Selling a product (at the end of a "use-life") or transferring (to another supply chain or different end customer).
	Retrofitting and material recycling	Renovating old infrastructures (ex. houses) and conducting downcycling, upcycling, or functional recycling.

Source: own elaboration based on (CircularPP 2019)

The circular actions can be applied by single person (not an enterprise or industrial operators). The main criterion of choosing the action is direct impact on quality of life which is belonging to human (Table 1). Compared to the original (CircularPP 2019), the description of some actions were changed, in purpose to present their connection with quality of personal life, as well as place of some actions (ex. 'sharing platform' is placed on consumption phase, not in production).
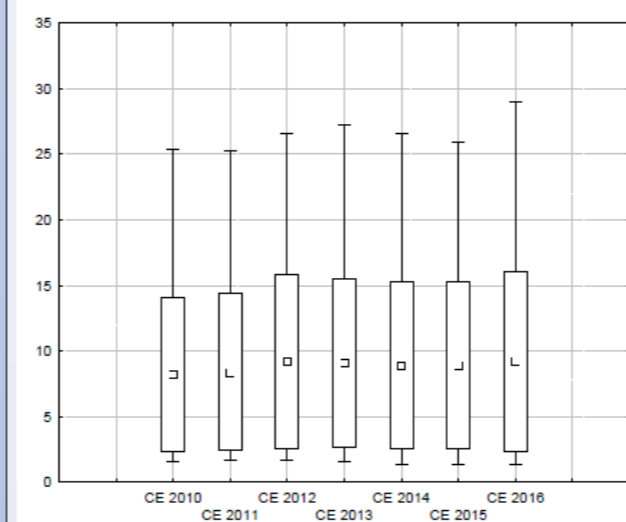
The approach to measure of quality of life

Quality of life is a multi-dimensional construct (Rapley 2003), which broadly encompasses how an individual measures the 'goodness' of multiple aspects (Theofilou 2013). The concept closely related to quality of life is a living standard, but most authors distinguish between them. **Living standard** concept is described by the living conditions and the level of meet the needs, which could be expressed by the set of objective indices. Ones of the most widely implemented measures in this subject are:

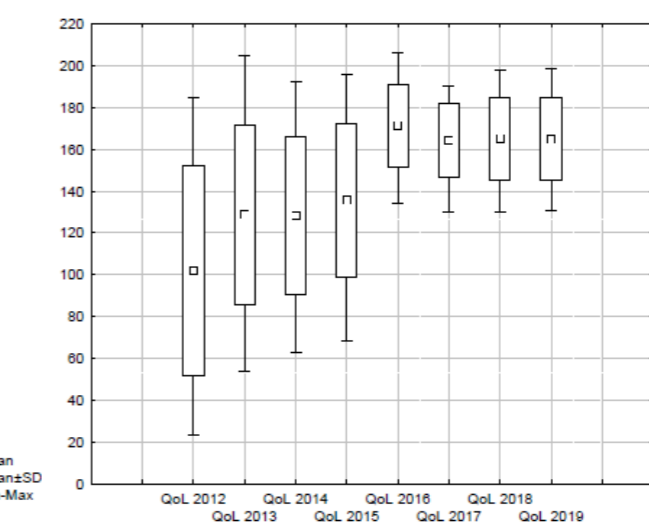1) Human Development Index (HDI),

2) Quality of Life Index (QoL).

Both mention measures are in line with the postulate to "move away from GDP" put forward by The European Commission based on analysis of the most prominent scientists (Stiglitz et al. 2009; Fleurbaey and Blanchet 2013; Stiglitz et al. 2018).

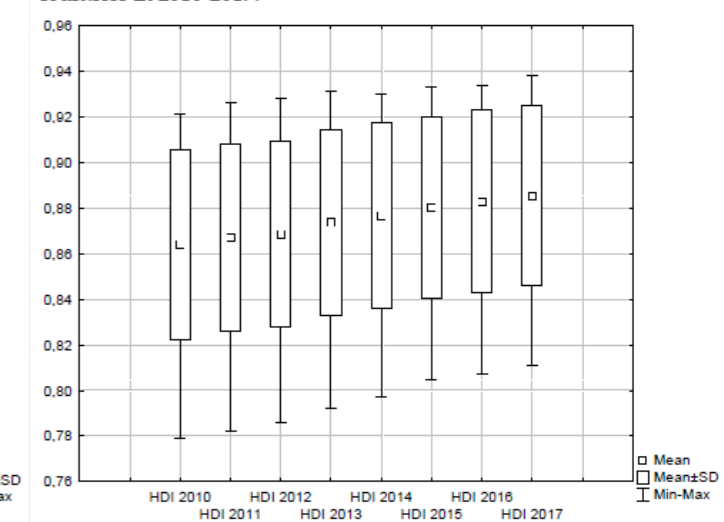Figure 1. The mean of circular material use rate (CE) for EU countries in 2010-2016.
Source: (Eurostat 2020)

Figure 2. The mean of Quality of Life Index for EU countries in 2012-2019.
Source: (Numbeo 2019)

Figure 3. The mean of Human Development Index for EU countries in 2010-2017.
Source: (UNDP 2017)

The results of the analysis

Due to the fact that the data concern the circular economy are limited (essential content, profile and time range), also the possibility to compare these data with the international quality of life databases is difficult. On the poster the results of preliminary analysis of dependence between circularity and quality of life is shown. In order to analyse the connection between circularity and increased quality of life, I standardized the values of each indicator and use Pearson's correlation coefficient and linear regression (Table 2). The statistically significant relation is observed only between HDI and CE; the relation between QoL and CE is not statistically significant, what caused that in the analysis of linear regression only the dependence between CE (independent variable) and HDI (dependent variable) was estimated.

Table 2. The summary of results of linear regression between circularity (CE) and quality of life (HDI)

Year	Multiple R	Multiple R²	Adjusted R²	F(1,22)	p (p<0.05)	Std.err. of estimate
2012	0.561	0.315	0.284	10.111	0.004	0.846
2013	0.559	0.313	0.281	10.007	0.0045	0.848
2014	0.511	0.261	0.227	7.771	0.011	0.879
2015	0.510	0.261	0.227	7.751	0.011	0.879
2016	0.477	0.228	0.193	6.4961	0.018	0.898

Year	Component	Beta	Std.err. of Beta	B	Std.err. of B	t(22)
2012	Intercept			0,000	0,173	0,000
	CE 2012	0,561	0,176	0,561	0,176	3,180
2013	Intercept			0,000	0,173	0,000
	CE 2013	0,559	0,177	0,559	0,177	3,163
2014	Intercept			0,000	0,179	0,000
	CE 2014	0,511	0,183	0,511	0,183	2,788
2015	Intercept			0,000	0,179	0,000
	CE 2015	0,510	0,183	0,510	0,183	2,784
2016	Intercept			0,000	0,183	0,000
	CE 2016	0,477	0,187	0,477	0,187	2,549

Source: own elaboration.

The results are statistically significant, but not explain the whole dependency (Adjusted R^2 reaches the values between 0.193 and 0.284, what means that in maximum only 28% of the model is explained by this combination of variables). To verify the correctness of the models built in this way, analysis of variance was used (tested hypothesis assumes that there is no difference between means: H_0: $\alpha_1 = 0$). The results of the analysis allows to reject of the tested hypothesis. The F-ratio (from Sndecor's F-distribution) for degrees of freedom (1&22) counts 6.4961 and in each year F is higher than tested ratio. It can therefore be said that each of the models is correctly matched to the data.

CONCLUSIONS

The attempt to evaluate of the connection between increasing circularity (express by use circular materials) and increasing the quality of life level, based on international, aggregated data shows positive impact but in some conditions: **1)** using indicators concerns the same matter could affects different results (HDI *vs.* QoL); **2)** overall data do not reflect the whole spectrum of analysed phenomenon. Adjusted determination coefficient (Adjusted R2) in my opinion is not so satisfied and testifies that it is necessary to enrich the model of influence the quality of life by new variables (but it could not reflect only the circular aspects). On that base I can state that there is a real need to conduct deep analysis of several aspects related with circular behaviour of single household members on the chosen quality of life dimension. It is caused the fact, that quality of life has various dimension and is very broad concept, so circularity and – in result – circular economy has not got direct influence of all of them. So, that is why, there is a need to narrow down the analysis to only direct factors.

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