APPLICATION OF CIRCULAR ECONOMY PRINCIPLES IN BUSINESS: THE CASE OF PRIMORSKO – GORANSKA COUNTY

MARTIN GOLOB, univ.spec.oec., Lecturer
Polytechnic of Rijeka,
Business Department
Trpimirova 2/V, Rijeka, Croatia
Contact: +385 (0)99 679 2230
E-mail: mgolob1@veleri.hr

MARINO GOLOB, mr.sc., Senior Lecturer
Polytechnic of Rijeka,
Business Department
Trpimirova 2/V, Rijeka, Croatia
E-mail: mgolob@veleri.hr

NIKOLINA TOKMADŽIĆ, Student
Polytechnic of Rijeka,
Business Department
Trpimirova 2/V, Rijeka, Croatia
E-mail: ntokmadzi@veleri.hr

Abstract

The main aim of the paper was to investigate familiarity with CE principles, application intensity of CE and the need for CE education in business organizations in the area of the Primorsko – goranska County in the Republic of Croatia. A survey was conducted in 2023 in order to gather relevant data that can be analyzed for this specific purpose. The results are presented on the total sample od respondents, then differences were investigated between public and private sector employees, manufacturing and services sector employees, age groups and employees' organization sizes. The overall findings suggest a lack of widespread understanding of CE principles among employees. The findings also support for an immediate educational effort focused on CE. The main findings of the survey indicate a higher prevalence of CE adoption in the private sector and among younger employees, predominantly in large organizations, but also highly adopted in micro and small business organizations.

Keywords circular economy, private sector, public sector, implementation

Original scientific paper
https://doi.org//10.20867/thi.27.12

INTRODUCTION

Traditional business models based on linearity dominated for many years. But, with the population growth on a global scale reaching 8 billion, trends of acceleration of urbanization and industrialization processes, global consumption and production on the rise and damaging environmental effects; it has become evident that a change must come (Marsullo, 2021). Linear economy models have slowly become unsuitable for future development and sustainability. The idea of resource circulation has had its debut at the Stockholm Conference (Ghosh, 2020) and since then, the idea has sparked change in the minds of many policymakers, researchers, business organizations and implementers to bridge from linear to circular, and as fast as possible. But, the speed of the change is not satisfactory, and this change has its own problems to deal with (Kyllönen, 2017). The biggest promise of the idea of Circular Economy (CE), at least from the business side, is creating an opportunity for great economic benefits. Benefits like 130 billion US dollars a year for only a part of the EU manufacturing sector (Ellen MacArthur Foundation, 2012) and other like social and environmental benefits (Anderson, 2005; Preston, 2012). In transitioning from linear to circular and creating those benefits, a cumulative effect can be gained in CE adoption on many levels. Many levels of "sharing, leasing, reusing, repairing, refurbishing, and recycling, in an (almost) closed loop, to limit the leakage of resources to the maximum extent possible "(Ghosh, 2020). This basic principle of CE should lead to the decoupling of economic growth and resource use (Lerwen & Seeram, 2021).

In that regard, it is noteworthy to investigate the current state of CE adoption, especially in local businesses, having in mind the beforementioned cumulative effect.

1. CIRCULAR ECONOMY: CORE CONCEPTS & PRINCIPLES

Defining CE goes back at least several decades, but as Rio et al. (2021) state, the concept was rarely the primary focus of many. There was only a handful of theoretical work done on CE before 2011, with many authors giving their focus subsequently thus reaching the peak of defining CE in 2018 (Rio et al., 2021). CE is an emerging concept, still. From the systemic perspective, CE happens on different hierarchy levels and it is, thus considered a multi-level framework (Rio et al., 2021). The levels can be summarized as micro levels (company or product level), meso-levels (in eco-industrial parks or value chains) and macro-levels (in cities and countries). For individual stakeholders, that being company or organization level, it is easier to tackle CE implementation from the standpoint of developing innovations or changing business practices. But the beforementioned cumulative effect at the micro-level, often does not have a very meaningful way of impacting higher levels of CE. The impact can be, at best, very modest. Nevertheless, it is important in the overall CE implementation strategy and, thus, should be encouraged, monitored and supported from all stakeholders. This paper focuses on the micro-level of CE in the Primorsko – goranska County in the Republic of Croatia. The most basic core concept of CE is the "closed cycle perspective" (Rio et al., 2021). The perspective emphasizes cycles that include products, components, materials and biological and processed materials that are meant to be "closed". The "3R" are famous at this point in time, meaning reduce, reuse and recycle in the form that represents a different economic activity. Other Rs followed. Today, there is up to 12 Rs that are proposed to be implemented at different levels of CE (in some literature there is 10 Rs). The 12 Rs don't exactly work when in isolation, and furthermore, the 12 Rs often overlap in application (Modak, 2021). List of the 12 Rs is given in the next table.

Table 1: **The 12 Rs**

Refuse	living within your basic needs and not consume more than needed
Reduce	bring down consumption
Re-design	serve purposes different from those set forth in the original design
Reuse	the process of re-using a product
Repair	put back into good condition or make it work again
Refurbish	improve older or damaged equipment to a workable condition
Renovate	to restore something to a newer or better state
Recycle	waste is collected, processed, and returned to raw material
Recover	waste is converted into resources
Return	take back products and packaging after use
Remanufacture	rebuild a product
Rethink	thinking out of the box to innovate

Source: Modak (2021)

Beside the 12-Rs framework, other main and important concepts can be identified (Weenk & Henzen, 2021) regarding CE. Concepts like *value retention* in product and materials after they are sold, organizing *return flows* of products and materials, *virgin material*, or *linear inflow*, being a raw material that has not been subjected to use or processing, other than that for its original manufacture, taking into account two different cycles – the *product concept and design* cycle and *product produce and use* cycle, the notion of *designing out waste* in the *concept and design cycle*. Related to strategies implementing CE, it is important to note the concepts of *closing, narrowing and slowing loops*, which directly connect to the concept of waste hierarchy and the 12-R framework; and the concept of *sustainable business models* where innovation takes place, thus fitting in sustainability into the overall development strategy of a business (Prokop et al., 2022). Having in mind all the stated above in this paper, from the many definitions of CE up until now, the authors chose the following definition as one to tie it all together: "the different practical strategies for achieving circular flows, applicable in a practical way by companies, captured by the 10-R framework, specifying hierarchical levels R0 to R9, applied to both the concept and design cycle, as well as the Produce and Use cycle" (Reike et al, 2018).

2. METHODOLOGY

2.1. Research Aims and Questions

The main aim and purpose of this paper is to establish the level of application of circular economy (CE) principles in business organizations in the geographic area of the Primorsko – goranska county in the Republic of Croatia. Such insights could be of great importance for the CE practitioners, but also for the management of public institutions, local authorities on different levels of operations and many stakeholders in the Republic of Croatia that seek to implement new solutions in order to attain sustainability in the long run. Research questions were as follows:

RQ1: What is the perceived familiarity with CE principles among employees?
RQ2: What is the perceived application of CE principles in business organizations?
RQ3: What is the perceived necessity of CE education for employees?

2.2. Socioeconomic Profile of the Respondents

In order to fulfill the main aim and purpose of the paper, an online questionnaire was administered between March and June of 2023 using a snowball sampling technique. The number of respondents amounted to a total number of 136 respondents. The questionnaire was administered in the Primorsko – goranska County in the Republic of Croatia. Out of the total number of respondents, 33% were males and 67% females. Most of the respondents belong to the age groups of 26 to 35 years (21%), 36 to 45 years (21%) and 46 to 55 years (29%). Equal number of respondents have a high school (38%) and graduate (38%) diplomas, while 24% of respondents have a bachelor degree. The 89% of respondents was employed in the time period the questionnaire was administered; and most of them (71%) were employed in the private sector and 86% of them in services.

Table 1: **Socioeconomic Profile of the Respondents**

Description		N	%
Gender	Male	45	33%
	Female	91	67%
	Total	136	100%
Age	0-18	0	0%
	19-25	20	15%
	26-35	28	21%
	36-45	29	21%
	46-55	40	29%
	55+	19	14%
	Total	136	100%
Education	High School	52	38%
	Undergraduate	32	24%
	Graduate	51	38%
	Doctorate	1	1%
Employment	unemployed	7	5%
	employed	121	89%
	retired	3	2%
	student	5	4%
Income level	0-400 €	10	7%
	401 - 600 €	5	4%
	601 - 800 €	24	18%
	801 - 1100 €	37	27%
	1101 - 1600 €	36	26%
	1600 € +	24	18%
	n/a	0	0%
Sectors I	Public	40	29%
	Private	96	71%
Sectors II	Manufacturing	19	14%
	Services	117	86%
Organization size	Micro	39	29%
	Small	37	27%
	Medium	31	23%
	Large	29	21%

Source: research results

Majority of respondents work in micro (29%) and small (27%) business organizations, while 23% of respondents work in medium and 21% of respondents work in large business organizations. The organization size classification used in this empirical research refers to 10 and fewer employees for micro business organizations, 50 and fewer employees for small business organizations, 250 and fewer employees for medium business organizations and 250 and more employees for large business organizations.

2.3. Research Methodology

As mentioned before in the paper, an online questionnaire was administered between May and July of 2023 using a snowball sampling technique *via* Google Forms. The questionnaire consisted of questions related to the respondents' demographic profile, monthly income level, status and size of the organization, and the last part consisted of questions related to the implementation of CE principles in their work environments. Respondents were instructed to fill the questionnaire only if they had any working experience (if studying) or that the answers be related to their last employment (if retired or unemployed). A Likert scale from 1 to 5 was used for the questions related to attitudes and perceptions related to CE implementation. Descriptive statistics were

used to analyze the results in order to present the results of the empirical research as simply and efficiently as possible. T-tests were used to establish statistical significance of the responses of employees working in the public sector and those working in the private sector, as well as those working in manufacturing and services sector and between age groups. ANOVA analysis was used to compare the responses of respondents working in micro and small, medium and large organizations.

3. RESULTS AND DISCUSSION

In this part of the paper, the results of the conducted empirical research will be presented, divided into five parts: research results that were obtained on the total sample of respondents, research results that refer to the comparison of results between the public and private sectors, research results that refer to the comparison of results between the manufacturing and services sector, research results that refer to the comparison of results between age groups of respondents and research results that refer to the comparison of results between employees working in micro and small, medium and large organizations.

3.1. Variables and Sample Results

The results of the conducted empirical research were obtained based on 8 questions regarding which the respondents had to answer their point of view. A Likert scale from 1 to 5 was used for all the stated perceptions, where 1 indicated the lowest intensity or frequency to 5 indicating the highest intensity or frequency. The variables investigated in the paper are shown in Table 2.

Table 2: **Variables**

A1	Rate your familiarity with the principles of the circular economy?
A2	Rate the intensity of application of circular economy principles in your organization?
A3	Rate the intensity of recycling in your organization?
A4	Rate the intensity of reuse of products/materials in your organization?
A5	Assess whether your organization uses recycled or reused materials in the production of new products/ providing services?
A6	Rate the intensity of sale or use of products from recycled materials in your organization?
A7	Rate the intensity of the intention to implement circular economy principles in your organization?
A8	Rate the intensity of the need for education in case of future application of circular economy principles in your organization?

Source: research questionnaire

Descriptive statistics (Table 3.) were used to show the empirical evidence gathered by the questionnaire. As evidenced by the results, the lowest mean of all the questions was related to A6 (Rate the intensity of sale or use of products from recycled materials in your organization?). The second lowest answer of all the respondents in the sample is related to A2 which demonstrates the intensity of application of CE principles in respondents' organizations. The mean related to A2 is 2.35 (median=2, mode=1). Answers related to recycling in the business organization (mean=2.97, median=3, mode=3) and answers related to need for education (mean= 3.09, median=3, mode=3) are the highest in the observed results.

Table 3: **Descriptive statistics: total sample of respondents**

Description (Total)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,54**	**2,35**	**2,97**	**2,68**	**2,45**	**2,27**	**2,50**	**3,09**
Standard Error	0,11	0,11	0,11	0,10	0,11	0,10	0,11	0,12
Median	3,00	2,00	3,00	3,00	2,00	2,00	2,00	3,00
Mode	1,00	1,00	3,00	3,00	1,00	1,00	1,00	3,00
Standard Deviation	1,31	1,27	1,26	1,21	1,29	1,19	1,28	1,40

Source: research results

It is important to notice that the means of each variable surveyed, do not pass the middle rate of 3, except for A8 related to need for education. Only variables A3, A4 and A8 have the mode of 3, every other variable in the sample results with mode of 1. The results clearly show that the application of CE principles in business organizations in the Primorsko – goranska County are not

at very high levels and that they mostly revolve around recycling and reuse of products and materials in organizations which is partially in line with previous findings (Berreiro-Gen & Lozano, 2020). Also, it is important to note, the intention to implement CE principles in the future is not at all satisfactory (mean=2.50, median=2, mode=1).

3.2. Public and Private Sector Results

Table 4 shows results compared to respondents' answers whether they are employed in public or private sector.

Table 4: **Public and Private Sector results**

Description (Public)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,23**	**1,98**	**2,65**	**2,40**	**2,08**	**2,08**	**2,10**	**2,95**
Standard Error	0,18	0,16	0,17	0,15	0,17	0,17	0,19	0,22
Median	2,00	2,00	3,00	3,00	2,00	2,00	2,00	3,00
Mode	1,00	1,00	3,00	3,00	1,00	1,00	1,00	3,00
Standard Deviation	1,17	1,00	1,05	0,96	1,10	1,07	1,17	1,38
Description (Private)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,68**	**2,50**	**3,10**	**2,79**	**2,60**	**2,35**	**2,67**	**3,15**
Standard Error	0,14	0,14	0,14	0,13	0,14	0,13	0,13	0,14
Median	3,00	2,50	3,00	3,00	3,00	2,00	3,00	3,00
Mode	1,00	1,00	4,00	3,00	1,00	1,00	3,00	4,00
Standard Deviation	1,35	1,35	1,33	1,29	1,33	1,23	1,29	1,41
P-value	0,067	**0,028**	0,056	0,086	**0,028**	0,214	**0,018**	0,458

Source: research results

The results observed in Table 4, in all surveyed variables show a higher mean in private sector than of those in the public sector. The biggest differences can be observed related to variables A2, A3, A5 and A7. Furthermore, t-tests were conducted to find if the differences between groups have a statistical significance; and statistical significance was found at A2, A5 and A7 variable. Results showing that private sector has a higher rate of CE implementation, use of recycled or reused materials in production of new products and/or services and higher intent related to CE implementation in the future is statistically significant and therefore applicable to a wider population.

3.3. Manufacturing and Services Sector Results

When observing results from Table 5, certain differences can be established that are not as straightforward as the results presented in Table 4.

Table 5: **Manufacturing and Services Sector results**

Description (Manufact.)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	2,21	2,11	2,68	2,89	2,47	2,47	2,63	3,11
Standard Error	0,25	0,26	0,27	0,27	0,29	0,26	0,29	0,34
Median	2,00	2,00	3,00	3,00	3,00	3,00	3,00	3,00
Mode	2,00	1,00	4,00	3,00	3,00	3,00	3,00	5,00
Standard Deviation	1,08	1,15	1,16	1,20	1,26	1,12	1,26	1,49
Description (Service)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	2,60	2,38	3,02	2,64	2,44	2,24	2,48	3,09
Standard Error	0,12	0,12	0,12	0,11	0,12	0,11	0,12	0,13
Median	3,00	2,00	3,00	3,00	2,00	2,00	2,00	3,00
Mode	1,00	1,00	3,00	3,00	1,00	1,00	1,00	4,00
Standard Deviation	1,34	1,29	1,28	1,21	1,30	1,20	1,28	1,39
P-value	0,233	0,377	0,289	0,399	0,927	0,428	0,630	0,955

Source: research results

Differences between manufacturing and services sectors can be clearly observed related to variables A1, A2 and A3. Familiarity with CE principles, application of CE principles and recycling in the organizations were more highly rated in the services sector. On the other hand, all other variables were highly rated in the manufacturing sector, meaning that application of principles of reuse, using recycled materials in the production process, sale and use of products made of recycled materials, as well as positive future intentions regarding CE is more common in the manufacturing sector. This could be related to the cost effectiveness of using CE principles in operations that can clearly be more visible in the manufacturing processes. Need for education related to CE principles is rated 3.09 in the services and 3.11 in the manufacturing sector, once again stressing the need for education as was evident when comparing results from the public and private sectors (highest rates). No statistically significant differences were observed (p-values were all above α=0.05). Familiarity and application of CE is more strongly evident in the services sector, but CE principles implemented in operations is more evident in the manufacturing sector, as is the intention to further implement CE in the future.

3.4. Age Group Results

Age groups of respondents were combined into two main age groups. One age group included respondents up to 45 years of age, and the other every respondent above (and including) the age limit of 46. The results related to both age groups are presented in Table 6.

Table 6: **Age group results**

Description (0-45 yrs)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,55**	**2,44**	**3,06**	**2,84**	**2,52**	**2,27**	**2,58**	**3,03**
Standard Error	0,16	0,16	0,14	0,14	0,15	0,14	0,15	0,17
Median	2,00	2,00	3,00	3,00	3,00	2,00	3,00	3,00
Mode	1,00	1,00	4,00	3,00	3,00	1,00	1,00	3,00
Standard Deviation	1,36	1,36	1,24	1,27	1,28	1,23	1,34	1,46
Description (46+ yrs)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,54**	**2,22**	**2,85**	**2,46**	**2,36**	**2,27**	**2,39**	**3,17**
Standard Error	0,16	0,15	0,17	0,14	0,17	0,15	0,15	0,17
Median	3,00	2,00	3,00	2,00	2,00	2,00	2,00	3,00
Mode	3,00	1,00	3,00	3,00	1,00	2,00	1,00	4,00
Standard Deviation	1,25	1,15	1,30	1,10	1,30	1,14	1,19	1,32
P-value	0,989	0,317	0,322	0,065	0,465	0,994	0,380	0,554

Source: research results

Although respondents' familiarity with CE principles was almost the same in both age groups, application of CE principles and the intensity of recycling was highly rated by younger employees. Once again, the need for education is the most highly rated variable in both observed groups, but the rate is slightly higher in 46 and above age group (mean=3.17). No statistically significant differences were observed (p-values were all above α=0.05), although variable A4 (reuse of products/materials) is almost statistically significant (α=0,065) and as such can provide potentially useful insight for further consideration. Given the results, it can be concluded that the variables are generally higher rated by younger employees.

3.5. Organization Size Results

As the last part of the analysis, gathered data was anatomized by the organization size, thus providing further insight related to application of CE principles in the Primorsko – goranska County. The results related to micro and small, medium and large business organizations are presented in Table 7.

Table 7: **Organization size results**

Description (MicSmall)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,62**	**2,34**	**3,08**	**2,75**	**2,51**	**2,26**	**2,54**	**3,07**
Standard Error	0,15	0,14	0,15	0,14	0,15	0,14	0,15	0,16
Median	3,00	2,00	3,00	3,00	2,50	2,00	3,00	3,00
Mode	3,00	1,00	4,00	3,00	1,00	1,00	1,00	4,00
Standard Deviation	1,28	1,26	1,29	1,26	1,32	1,25	1,30	1,44

Description (Medium)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,48**	**2,32**	**2,68**	**2,52**	**2,32**	**2,26**	**2,39**	**3,19**
Standard Error	0,26	0,23	0,22	0,22	0,21	0,19	0,22	0,26
Median	2,00	2,00	3,00	3,00	2,00	2,00	2,00	3,00
Mode	1,00	1,00	3,00	3,00	1,00	1,00	1,00	3,00
Standard Deviation	1,43	1,28	1,22	1,23	1,19	1,06	1,20	1,45

Description (Large)	A1	A2	A3	A4	A5	A6	A7	A8
Mean	**2,41**	**2,38**	**3,00**	**2,66**	**2,41**	**2,31**	**2,52**	**3,03**
Standard Error	0,24	0,25	0,23	0,20	0,25	0,22	0,25	0,24
Median	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00
Mode	3,00	1,00	3,00	3,00	1,00	3,00	1,00	3,00
Standard Deviation	1,30	1,35	1,22	1,08	1,32	1,20	1,33	1,27

P-value	0,745	0,985	0,329	0,662	0,778	0,981	0,854	0,889

Source: research results

Although no statistically significant differences between groups were evidenced (p-values were all above α=0.05 and several very high – above α=0.9), the results still provide interesting insights. Familiarity with CE principles was the highest among employees working in micro and small organizations (mean=2.62). Application of CE principles was the highest among employees working in large organizations (mean=2.38). The lowest rated variable (A6 – sale or use of products from recycled materials) was evidenced as the same in all organization sizes. Need for education related to CE is most prominently evidenced in medium organizations (mean=3.19). Overall, the results show below average familiarity and application of CE principles across different organization sizes. The lowest rated variable in all observed organization sizes was related to sale and/or use of products made out of recycled or reused materials, leaving much to be desired in Primorsko – goranska County organizations related to application of CE principles.

CONCLUSION

This paper aimed at providing insights related to CE principles in various organizations across the Primorsko – goranska County in the Republic of Croatia. The gathered data provides for interesting results among employees in public and private sector, manufacturing and services sector, age group differences and different organization sizes of business entities. The general conclusion, based on the total number of respondents, is that there is a sub-par familiarity with CE principles in general, as well as the application of such principles in respondents' organizations, which is partially in line with similar research conducted by Ormazabal et al. (2018). The immediate need for education related to CE is strongly supported by the results and the attitude of employees related to CE education reflects the issue. The results clearly show that CE application is more prevalent in the private sector, bearing cost effectiveness in mind, than of organizations in the public domain. Statistically significant differences were found related to intensity of CE application, use of recycled or reused materials in production processes and the intent to further implement CE in the future. All beforementioned variables were more intense in the private sector. Also, the results show that younger employees apply CE at a much higher rate than older employees. The need for CE education is stronger in older employees.

Limitations should be addressed to a small sample size (n=136) and to a limited geographical area the survey was conducted. Recommendations for further research refer to future in-depth research related to benefits or opportunities of CE implementation, as well as barriers in CE implementation.

REFERENCES

Andersen, M. S. (2006). An introductory note on the environmental economics of the circular economy. Sustainability Science, 2(1), 133–140. https://doi.org/10.1007/s11625-006-0013-6

Berreiro-Gen, M., Lozano. R. (2020). How circular is the circular economy? Analysing the implementation of circular economy in organisations. Business Startegy and the Environment, Volume 29, Issue 8, https://doi.org/10.1002/bse.2590

Ellen MacArthur Foundation. (2012), "Towards the Circular Economy: Economic Business Rationale for an Accelerated Transition".

Ghosh, S. K. (Ed.). (2020), "Circular Economy: Global Perspective", Springer Nature Singapore Pte Ltd. ISBN 978-981-15-1051-9, https://doi.org/10.1007/978-981-15-1052-6

Henzen, R., & Weenk, E. (Eds.). (2020), "Mastering the Circular Economy: A Practical Approach to the Circular Business Model Transformation", Kogan Page

Kyllönen, M. (2017). Can the EU's circular economy apply to ports? The Parliament Magazine, (May), 1–5. https://www.theparliament magazine.eu/news/article/can-the-eus-circular-economy-apply-toports

Lerwen, L., Seeram, R. (2021). An Introduction to Circular Economy. Springer Singapore, https://doi.org/10.1007/978-981-15-8510-4

Marsullo, L. (2021). The Present Contribution Of Circular Economy To Stimulate Economic Growth In The World. in: An introduction to the circular economy. Morganti, P., Collteli, M.B. (Editors). Nova Science Publishers. ISBN: 978-1-53619-233-9

Modak, P. (2021), "Practicing Circular Economy", CRC Press. ISBN 978-1003107248 (eBook)

Ormazabal, M., Prieto-Sandova, V.l, Puga-Leal, R., Jaca, C. (2018). Circular Economy in Spanish SMEs: Challenges and Opportunities, Journal of Cleaner Production, doi: 10.1016/j.jclepro.2018.03.031

Preston, F. (2012a). A global redesign? Shaping the circular economy. Energy, Environment and Resource Governance, (March), 1–20. https://doi.org/10.1080/00346760420002539 36, 62

Prokop, Viktor & Stejskal, Jan & Horbach, Jens & Gerstlberger, Wolfgang. (2022). Business Models for the Circular Economy: A European Perspective. Springer Nature Switzerland AG

Reike, D., Vermeulen, W., & Witjes, S. (2018), "The Circular Economy: New or Refurbished as CE 3.0? Exploring Controversies in the Conceptualization of the Circular Economy Through a Focus on History and Resource Value Retention Options", Resources, Conservation and Recycling, 135. DOI: 10.1016/j.resconrec.2018.03.018.

Río, P. del, Kiefer, C. P., Carrillo-Hermosilla, J., & Könnölä, T. (2021), "The Circular Economy: Economic, Managerial and Policy Implications", Springer Nature Switzerland AG. Green Energy and Technology. ISBN 978-3-030-74791-6, https://doi.org/10.1007/978-3-030-74792-3