

# Circular economy needs more comprehensive and inclusive status at Finnish universities of applied sciences

Authors: K. Laasasena<sup>a\*</sup>, R. Lauhanen<sup>a</sup>, A. Voutilainen<sup>b</sup>, K. Knuutila<sup>b</sup>, S. Tyni<sup>c</sup>, J. Suominen<sup>d</sup>, P. Nurmi<sup>e</sup>, P. Viluksela<sup>f</sup>

<sup>a</sup>School of Food and Agriculture, Seinäjoki University of Applied Sciences, Seinäjoki, Finland

<sup>b</sup>Institute of Bioeconomy, JAMK University of Applied Sciences, PO BOX 207 FI-40101 Jyväskylä, Finland

<sup>c</sup>School of Arctic Natural Resources and Economy, Lapland University of Applied Sciences, Jokiväylä 11 C 96300 Rovaniemi, Finland

<sup>d</sup>Corporate Services, RDI Activity, Turku University of Applied Sciences, Joukahaisenkatu 3 20520 Turku, Finland

<sup>e</sup>Engineering and Business, Chemical Industry, Turku University of Applied Sciences, Joukahaisenkatu 3 20520 Turku, Finland

<sup>f</sup>Metropolia University of Applied Sciences, Leiritie 1, 01600 Vantaa, Finland



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## Abstract

Circular economy is an alternative for fossil resource based, “take-make-use-dispose”, linear economy. The shift from traditional unsustainable economy towards circular economy is an inter- and multidisciplinary process which requires wide cooperation with several actors. Transformation towards circular economy additionally requires reformation and adaptation in all levels of education. Due to the close relationship with work life, the role of Finnish universities of applied sciences (UAS) have been recognized as a crucial player in the development of circular economy education. The status of circular economy at 18 Finnish UAS's was studied in 2018 using a questionnaire for the staff members. The aim was to find out how circular economy education is implemented at the UAS's. The data was studied qualitatively and quantitatively, e.g. the statistical differences were studied by Spearman's correlation coefficient. The results were used for the development of novel circular economy education, consisting of new methods, such as learning environments and e-learning platforms. According to the results, circular economy is moderately known amongst the staff members. Majority of the courses handling circular economy are available in the field of civil engineering, natural resources and business administrative, since most of the respondents were working on these fields. Most of the courses and programs were provided at bachelor level and average credits (ECTS) varied between 3-15. It was observed, that the fields of humanities and education were lacking of responses. However, significant statistical differences between variables were not observed in this study.

### Highlights

- 1) Current status of circular economy was studied with questionnaire at 18 Finnish University of applied sciences (UAS) in 2018
- 2) The circular economy is relatively well integrated in civil engineering, natural resources and business economics
- 3) Most of the courses and programs were provided at bachelor level and average credits varied between 3-15 (ECTS) .
- 4) Circular economy is almost invisible in the humanities, the education sector, the social and health sectors.
- 5) More comprehensive and inclusive methods are needed to introduce circular economy at UAS

## Introduction

Circular economy is recognized as an alternative for fossil resource based, “take-make-use-dispose”, traditional linear economy. Circular economy is based on wise use of resources and it is closing the loop of resources taken in use. It has potential to reduce negative environmental impacts and to mitigate climate change because materials and resources are used effectively and resource-wisely. The shift from traditional unsustainable economic system towards circular economy is interdisciplinary process, which should be cross-sectoral (Ellen MacArthur Foundation 2018).

Consequently, circular economy forces education systems to change. However, many of the current studies are concerning circular economy business models (e.g. Planing 2015, Lewandowski 2016), and there are only limited amount of publications handling circular economy education (e.g. Andrews 2015), or how it should be trained at schools or in higher education. The forerunners in the field are Ellen MacArthur Foundation and Sitra – Finnish Innovation Fund, which are both promoting circular economy education.

Publications concerning practical higher education level are almost absent, despite few examples eg. Kilkis, & Kilkis (2017), Forslund (2018), Hall & Velez-Colby 2018 and Whalen et al. (2018). Circular economy demands actions also at schools and educational system so that it can be included in education programmes. Currently, there are differences between countries about how integrated circular economy is at schools (Forslund 2018).

In this article, the current status of circular economy was studied at 18 Finnish universities of applied sciences (UAS). There are totally 25 universities of applied sciences in Finland so most of them were covered in this study. Universities of applied sciences or sometimes called Vocational universities are officially used terms in many European countries such as Sweden, Germany, Austria and Netherlands and their responsibility is to offer applied research for the work life. Even tough, circular economy has been mapped globally, more deepened analysis about the integration in different disciplines should be studied.

## Materials and methods

The status of current circular economy education was studied with a questionnaire. The questionnaire was made with Webropol program (v. 2.0). The questionnaire was sent for the key players of personnel of circular economy at 19 UAS. Then the persons were requested to send the questionnaire for other crucial staff members working with the field of circular economy. Both teachers and research, development and innovation (RDI) personnel were invited to answer the questionnaire.

Totally 104 persons answered to the survey from 18 UAS. The response rate varied from 0.1 to 3.4 % per UAS. A median respondent was a woman (from 51 to 60 years old) with a master degree and a good understanding of the circular economy. Also, the median respondent was working in the field of technology, industry or construction.

The quantitative data results were analysed statistically with SPSS (ver. 25) programme and content analysis was made for qualitative data by clustering the answers under the same theme. Spearman correlation analysis was used to measure possible relationships between the variables and also crosstabs and Chi-Square Tests in SPSS. The answers were compared to respondents' background information.

## Results and conclusions

According to the results, circular economy is moderately known amongst the staff members (Figure 1). The results show that the integration of circular economy in different disciplines is relatively strong especially in engineering, natural resources and business education of UAS. However, there were lack of knowledge in humanities, education and health and wellbeing as most of the respondents were representing civil engineering and natural resources (Table 1). In general, the respondents were saying that circular economy was especially well integrated in energy and environmental technology (N= 12) and agriculture and forestry (N=5). On the other hand, respondents felt that circular economy was poorly integrated in material related courses (e.g. rock and concrete), hotel and catering, and marketing and general business economics. Statistically significant differences (p=0.05) between the variables of the UASs were not found.

Due to the close relationship with work life, the role of UAS is crucial in the development of circular economy education. It is also important to give to teachers enough resources to familiarize themselves with the concept. The circular economy needs to be quickly integrated into education, so that work life experts and stakeholders get relevant information to mitigate climate change and implement circular economy in practice.

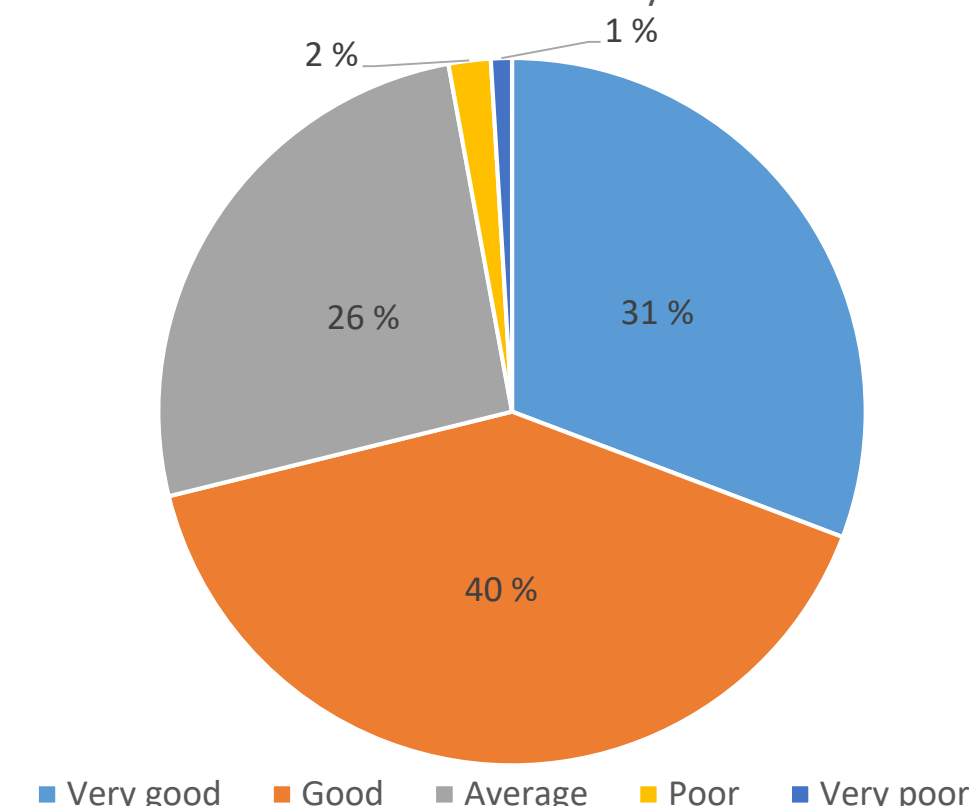
Table 1. Circular economy related courses in the studied UASs in 2018.

Discipline	Amount of courses or programmes	Bachelor level	Master level	Average ECTS credits	Median ECTS credits
General circular economy	28	25	3	8	5
Technology, industry and construction	23	23		6	5
Agriculture and forestry	20	18	2	15	6
Trade and Administration (Business Economics, Management Assistant and Languages)	13	10	3	5	5
Arts and culture	5	5	1	11	10
Services (beauty care, library and information services, transport and transportation, sport, tourism, shipping, security)	1	1		3	3
Social services	1	not reported	not reported	not reported	not reported
Not correctly reported or identified	6	4	1	27	6
Total	97	86	10	11	5

## References:

- Andrews, D. (2015). The circular economy, design thinking and education for sustainability. *Local Economy*, 30(3), 305–315. <https://doi.org/10.1177/0269094215578226>
- Ellen MacArthur Foundation 2018. What is circular economy? Available: <https://www.ellenmacarthurfoundation.org/circular-economy/concept> (16.11.2018).
- Forslund, T. 2018. A global snapshot of circular economy learning offerings in higher education (September 2018). Ellen MacArthur Foundation. Version 2 with updated map, 19 October 2018. Available: <https://www.ellenmacarthurfoundation.org/assets/downloads/Global-Snapshot-19.10.18-1.pdf> (15.11.2018).
- Hall, N. & Velez-colby, F. 2018. AMFI's Reality school: a circular economy agenda for fashion education. *Art, Design & Communication in Higher Education* 17(1): 11–24. doi: 10.1386/adch.17.1.11\_1
- Kilkis, S., & Kilkis, B. (2017). Integrated circular economy and education model to address aspects of an energy-water-food nexus in a dairy facility and local contexts. *Journal of Cleaner Production*, 167, 1084–1098. <https://doi.org/10.1016/j.jclepro.2017.03.178>
- Lewandowski, M. (2016). Designing the Business Models for Circular Economy — Towards the Conceptual Framework. *Sustainability* 2016, 8(1), 43; <https://doi.org/10.3390/su8010043>
- Planing, P. (2015). Business Model Innovation in a Circular Economy Reasons for Non-Acceptance Business Model Innovation in a Circular Economy Reasons for Non-Acceptance of Circular Business Models, *Open Journal of Business Model*. Scientific Online. In press
- Whalen, K. A., Berlin, C., Ekberg, J., Barletta, I., & Hammersberg, P. (2018). 'All they do is win': Lessons learned from use of a serious game for Circular Economy education. *Resources, Conservation and Recycling*, 135(May 2017), 335–345. <https://doi.org/10.1016/j.resconrec.2017.06.021>

Figure 1. Respondents' level of knowledge of the circular economy



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