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Roadshow
on Circular Economy

28 October 2021
14:00-15:30 CEST
13:00-14:30 BST

SAVE THE DATE

Panellists


Jan Dalstent
Danish National Archives


Konstantinos Tsagarakis
Technical University of Crete


Johana Chylíková
Czech Social Science Data Archive


Ana Slavec
InnoRenew CoE

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Agenda #CESSDARoadshow

1. **Introduction and Survey Announcement**, CESSDA® & Trust-IT
2. **CESSDA Data Catalogue® - Discovery of Danish Datasets related to the Circular Economy,** Jan Dalsten, Danish National Archives
3. **Use case on Circular Economy Research - A view on societal impacts and priorities,** Konstantinos Tsagarakis, Professor of Economics of Environmental Science and Technology at the Technical University of Crete.
4. **CESSDA Data Management Expert Guide® - Organise & Process**, Johana Chylíková, Czech Social Science Data Archive (CSDA)
5. **Challenges with the reuse of data on circular economy: Experience of researchers at the InnoRenew CoE**, Ana Slavec, InnoRenew CoE Renewable Materials and Healthy Environments Research and Innovation Centre of Excellence
6. **Interactive Discussion & Wrap up**

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cessda Roadshow Series 2021

30 September
8-14-21-28 October

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CESSDA is an ESFRI (European Strategy Forum on Research Infrastructures) Landmark. CESSDA is an ERIC (European Research Infrastructure Consortium), a European legal entity.

Roadshow Synergies

CESSDA SERVICE PROVIDERS

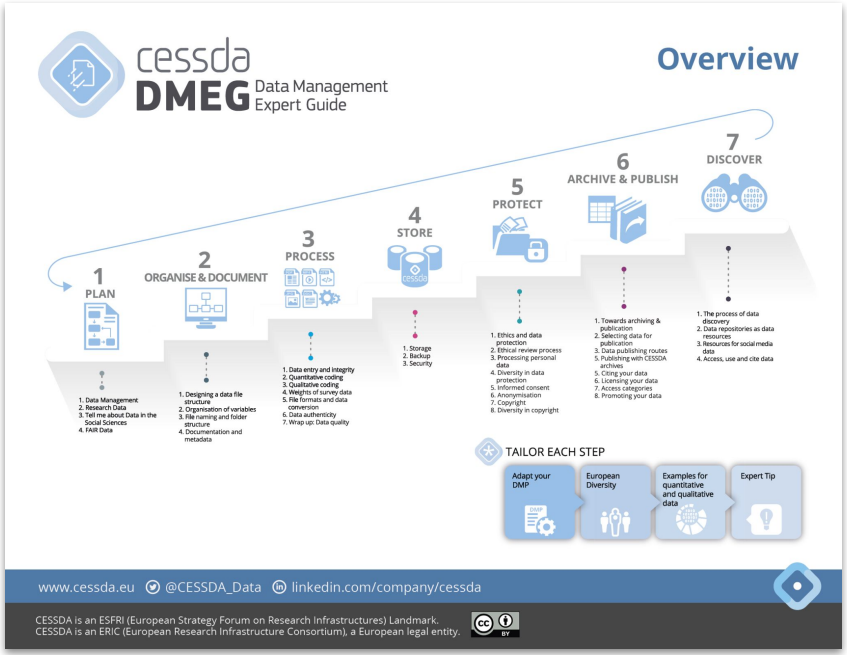
- APIS – Arquivo Português de Informação Social
- AUSSDA – Austrian Social Science Data Archive
- DANS – Data Archiving and Networked Services
- EKKE – Hellenic National Centre for Social Research
- FINNISH SOCIAL SCIENCE DATA ARCHIVE
- gesis – Leibniz Institute for the Social Sciences
- NSD – NORSK SENTER FOR FORSKNINGSDATA
- UK Data Service
- SciencesPo

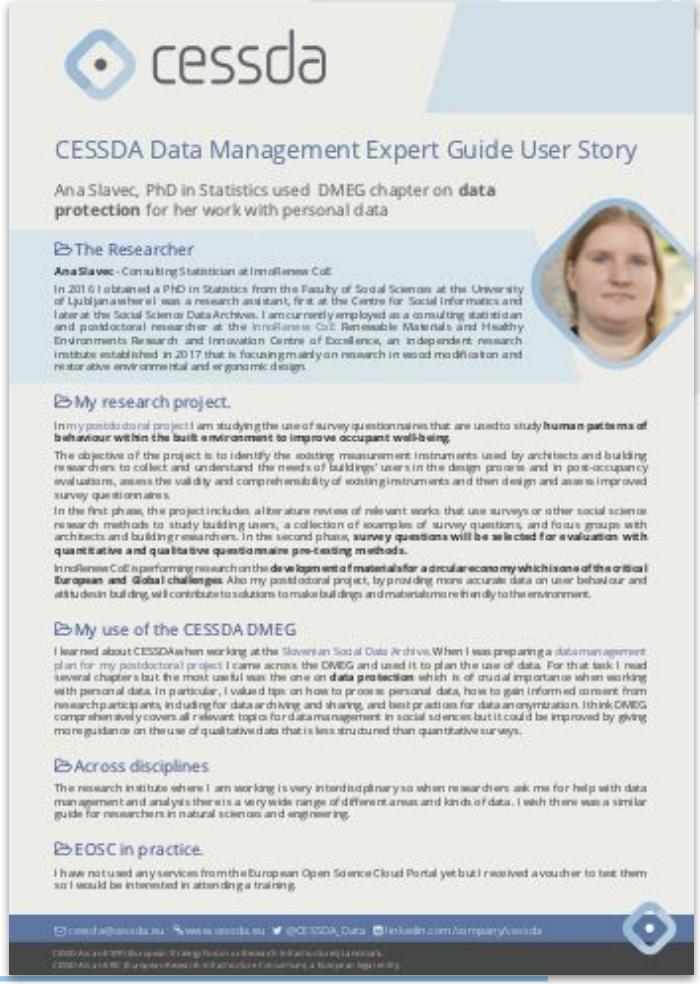
SYNERGIES WITH

- eurodoc – The European Council of Doctoral Candidates and Junior Researchers
- HumMingBird
- INCREATE
- SSHOC

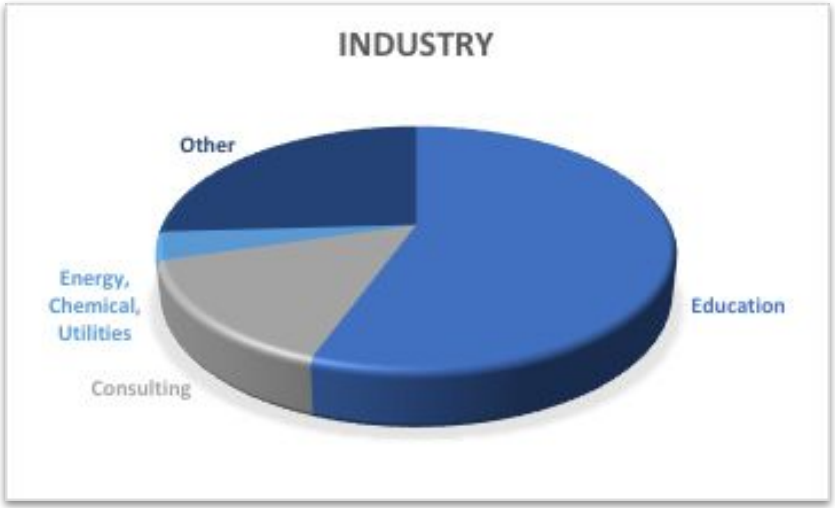
CESSDA Data Catalogue

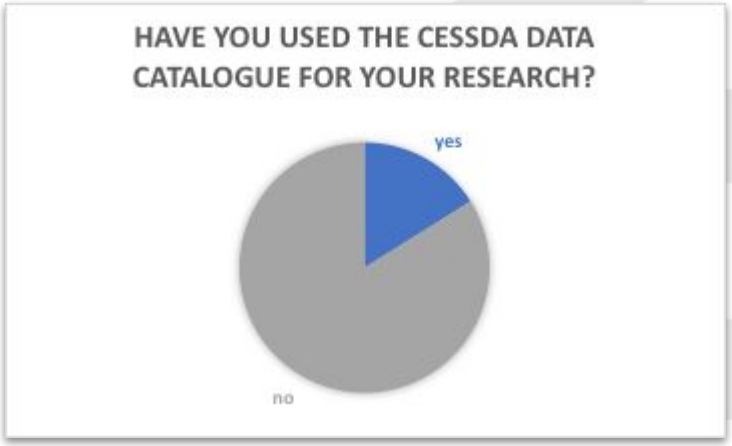
Data Management Expert Guide





About you





While diving deep into the CESSDA Data Catalogue for discovery, we are very interested in learning about your user stories!

Got 3 minutes? We'd love your input!

Take our data users' survey by clicking the link in the chat! Or directly: https://www.surveymonkey.de/r/7B3C35K

To enter the raffle for a free Audible audiobook, type a random FOUR DIGIT NUMBER in the space provided. The winner will be announced in the chat at the end of the webinar.

The survey data collected by CESSDA will improve CDC user experience. IP addresses are NOT collected. Emails given as part of the qualitative component will be deleted upon completion of the interview, in compliance with GDPR requirements.

RIGSARKIVET

Circular Economy

Data for Research and Reuse in the Cessda Data Catalogue from the Danish National Archives (DNA)

Setting the Stage

The environment, climate change, recycling, circular economy – those are all really important issues for the world today. To develop a more sustainable way of life requires research in various fields ranging from innovative technical solutions to research about how to change the way we all think about the issues and act in our daily lives.

What can we find in the archives have that can support and enhance that research?

RIGSARKIVET

Examples of Datasets at the DNA

- At the DNA the born-digital collections include both research data, especially surveys, and administrative/governmental data
- The survey datasets can be found in the Cessda Data Catalogue and will be the focus today
- ….but remember, that surveys could be used together with other data, such as government data

RIGSARKIVET

Examples of Datasets at the DNA from the Cessda Data Catalogue

- Moral norms and environmentally significant consumer choices
- Danish Environment (ISSP 2000)
- Danish Environment (ISSP 2010)
- Pro-environmental consumer behaviour and young adult's consumer socialization, 2006
- The development of a sustainable consumption pattern in Denmark, 1998, 1999 and 2000
- Danish Youth and Climate Change, 2010

Example CDC: Danish Environment 2010

Summary information

Study title

Danish Environment (ISSP 2010)

Creator

Sanne Lund Clement (Institut for Økonomi, Politik og Forvaltning, Aalborg Universitet,)

Study number / PID

25919
10.5279/DK-SA-DDA-25919

Abstract

This study contains information on environmental values, attitudes and actions. The study examines the attitudes towards science, economy, environment and the effectiveness of environmental measures. ISSP (International Social Survey Programme) is an international collaboration between 49 countries. The following background variables were included in the survey: Age, sex, marital status, number of persons living in the household, education, the respondents' income, the household income, main employment, union membership, employment of spouse, membership of the national church, church attendance, voting at the last general election, social class, preferred political party and denomination.

Example, ctd.

Methodology

Data collection period

21/10/2010 - 05/04/2011

Country

national
national

Time dimension

Cross-sectional study

Analysis unit

Sampling procedure

Simple random sample

Data collection mode

Mail survey

RIGSARKIVET

Example, ctd.

Topics

Natural environment: Environmental degradation/pollution and environmental protection

Keywords

Sorting of refuse | Nuclear power station | Energy saving | Energy consumption | Energy saving behavior | Consumption | Gene manipulation | Attitude towards politicians | Attitude towards science | Difference in income | Climate change | Air pollution | Trust in your fellow citizens | Environment | Environmental protection | Concern for environmental problems | Environmental protest | Environmental pollution | Environmental policy | Environmental issue | Environmentally correct product | Environmentally-friendly | POLITICAL ISSUES | Trust | Ecology | Economic subjects

RIGSARKIVET

Similar results

Sample Questions from the Surveys

RIGSARKIVET

The Waste Data System

- A ressource from the government
- Contains information about all waste that has been collected, processed, recycled, exported etc.
- Could possibly be used to put the surveys into context. Are the consumers increasingly willing to recycle? And if yes, can this be reflected in the actual numbers for recycling vs. waste to be burned? Etc.

RIGSARKIVET

Questions, comments?

E-post: jds@sa.dk
Twitter: jdalsten

Illustration: digitalbevaring.dk

Circular Economy Insights from Europe and Interest in South-Eastern Asia

Professor Konstantinos P. Tsagarakis

September 2021-

School of Production Engineering and Management , Technical University of Crete

2007-August 2021

Department of Environmental Engineering, Democritus University of Thrace

Sections of my Presentation

Macro data

Published Work

Social and economic determinants of materials recycling and circularity in Europe: an empirical investigation

Ioannis Kostakis, Konstantinos P. Tsagarakis

Under Review

The role of entrepreneurship, innovation and socioeconomic development on circularity rate: Empirical evidence from selected European countries

Ioannis Kostakis, Konstantinos P. Tsagarakis

LinkedIn Data

Under Preperation

-LinkedIn and Circular Economy: European companies' engagement in circular economy

Tsironis Georgios, Daglis Theodoros, Konstantinos P. Tsagarakis

Resources and Publication Outlets

Social and economic determinants of materials recycling and circularity i n Europe: an empirical investigation

The Annals of Regional Science
https://doi.org/10.1007/s00168-021-01074-x

SPECIAL ISSUE PAPER

Social and economic determinants of materials recycling and circularity in Europe: an empirical investigation

Ioannis Kostakis[1,2] · Konstantinos P. Tsagarakis[3]

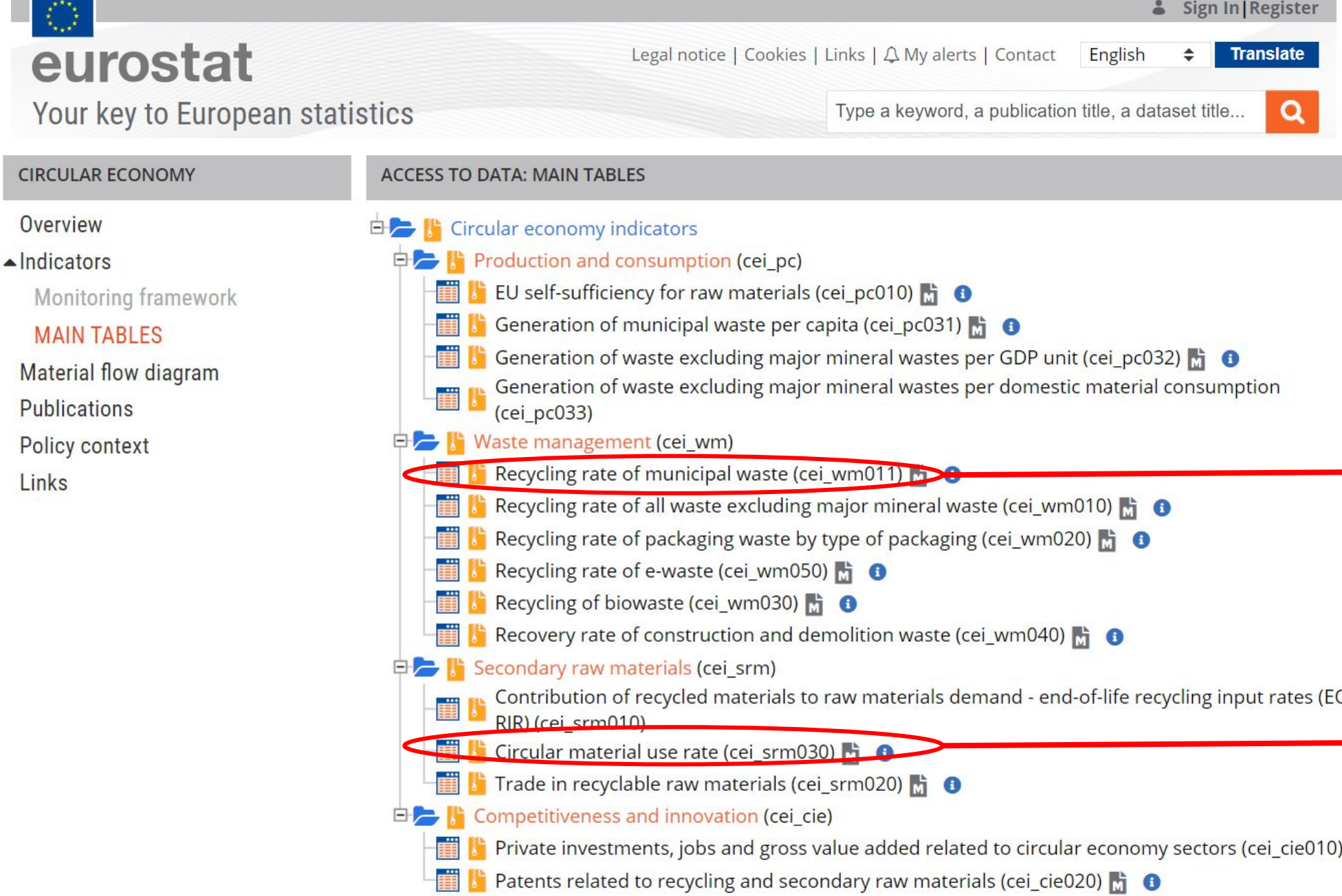
Received: 13 October 2020 / Accepted: 10 August 2021

Abstract
The present empirical study sheds light on the role of socioeconomic characteristics toward circular economy, resulting in more sustainable production and consumption patterns. Using fixed-effects and instrumental variable fixed-effects panel approaches, we examine the role of social and economic determinants on materials recycling and circularity in the European Union (EU). Empirical results reveal that recycling and circularity rates are positively affected by factors such as economic wealth, fertility rate, the level of environmental taxes and R&D expenditures. Furthermore, urbanization also seems to have a positive, but nonlinear effect on recycling and circularity rates. Our results can be beneficial to decision makers and managers for implementing several policies aiming to increase recycling and circularity across the EU and beyond.

JEL Classification O13 · Q56

Free access here:

https://rdcu.be/cwitY



https://ec.europa.eu/eurostat/web/circular-economy/indicators/main-tables

Recycling rate of municipal waste (percentage)

Definition

The indicator measures the share of recycled municipal waste in the total municipal waste generation. Recycling includes material recycling, composting and anaerobic digestion. The ratio is expressed in percent (%) as both terms are measured in the same unit, namely tonnes.

Relevance

Recycling rate of municipal waste gives an indication of how waste from final consumers is used as a resource in the circular economy. Municipal waste reflects mainly waste generated by the final consumers as it includes waste from households and waste from other sources that is similar in nature and composition to household waste. Although it accounts for around 10% of total waste generated in the EU, because of its heterogeneous composition the sound management of municipal waste is challenging. The recycling rate of municipal waste provides a good indication of the quality of the overall waste management system.

Source

Eurostat. Municipal waste by waste operations (*env_wasmun*) collected via a subset of the OECD/Eurostat Joint Questionnaire, section waste (see *guidance document on municipal waste*). Data are provided under a so-called gentlemen's agreement.

Circular material use rate (percentage)

Definition

The indicator measures the share of material recovered and fed back into the economy - thus saving extraction of primary raw materials - in overall material use. The circular material use (CMU) rate is defined as the ratio of the circular use of materials to the overall material use.
The overall material use is measured by summing up the aggregate domestic material consumption (DMC) and the circular use of materials. DMC is defined in economy-wide material flow accounts.
The circular use of materials is approximated by the amount of waste recycled in domestic recovery plants minus imported waste destined for recovery plus exported waste destined for recovery abroad. Waste recycled in domestic recovery plants comprises the recovery operations R2 to R11 - as defined in the Waste Framework Directive 75/442/EEC. The imports and exports of waste destined for recycling - i.e. the amount of imported and exported waste bound for recovery – are approximated from the European statistics on international trade in goods.
A higher CMU rate value means that more secondary materials substitute for primary raw materials thus reducing the environmental impacts of extracting primary material.

Relevance

The circular economy aims at increasing the amount of material recovered and fed back into the economy, therefore reducing the generation of waste and limiting the extraction of primary raw materials. The circular material use rate measures the contribution of recycled materials to overall materials demand..

Source

Eurostat. The CMU rate indicator is calculated using three European statistics: (1) Treatment of waste by waste category, hazardousness and waste operations (*env_wastrt*) collected on the basis of the Waste Statistics Regulation *(EC) No 2150/2002*, (2) economy-wide material flow accounts (*env_ac_mfa*), and (3) *international trade in goods statistics* (*comext*). The amounts of waste treated in domestic recovery operations (1) are corrected by net exports of waste destined for recycling sourced from Comext database (3).

https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework

Circular material use rate (online data code: CEI_SRM030)
Source of data: Eurostat

Settings: Bookmark view

Table | Line | Bar | Map

GEO	TIME	012	2013	2014	2015	2016	2017	2018	2019
European Union - 27 countries (from 2020)		11	11.2 (s)	11.1	11.2 (s)	11.4	11.4 (s)	11.5	11.8 (s)
European Union - 28 countries (2013-2020)		1.4	11.6 (s)	11.5	11.7 (s)	11.9	11.9 (s)	12.1	12.4 (s)
Euro area - 19 countries (from 2015)		:	:	:	:	:	:	:	:
Belgium		6.9	16.8 (s)	17.6	17.7 (s)	17.6	18.5 (s)	19.9	24.2 (s)
Bulgaria		1.9	2.5 (s)	2.7	3.1 (s)	4.4	3.5 (s)	2.5	2.3 (s)
Czechia		6.3	6.7 (s)	6.8	6.9 (s)	7.5	7.9 (s)	8	8.3 (s)
Denmark		6.4	7.7 (s)	9	8.3 (s)	8	7.9 (s)	8.1	7.6 (s)
Germany (until 1990 former territory of the FRG)		0.7	10.9 (s)	10.8	11.5 (s)	11.6	11.3 (s)	11.7	12.3 (s)
Estonia		9.1	14.6 (s)	10.9	11.3 (s)	11.6	12.4 (s)	13.5	15.6 (s)
Ireland		1.8	1.7 (s)	2	1.9 (s)	1.7	1.7 (s)	1.6	1.6 (s)
Greece		1.9	1.8 (s)	1.4	1.9 (s)	2.3	2.8 (s)	3.3 (p)	4.2 (s)
Spain		9.8	8.9 (s)	7.7	7.5 (s)	8.2	8.9 (s)	9.3	10 (s)
France		6.9	17.3 (s)	17.8	18.7 (s)	19.4 (p)	18.8 (s)	19.5	20 (s)
Croatia		3.6	3.9 (s)	4.8	4.6 (s)	4.6	5.2 (s)	5	5.2 (s)
Italy		3.9	16 (s)	16.1	17.2 (s)	17.8	18.4 (s)	18.8	19.5 (s)
Cyprus		2	2.4 (s)	2.2	2.4 (s)	2.4	2.4 (s)	2.8	2.9 (s)
Latvia		1.3	3.8 (s)	5.3	5.3 (s)	6.5	5.4 (s)	4.7	4.3 (s)
Lithuania		3.8	3.1 (s)	3.7	4.1 (s)	4.6	4.5 (s)	4.3	3.9 (s)
Luxembourg		8.5	15.4 (s)	11.3	9.7 (s)	7.1	10.6 (s)	10.8	10.5 (s)
Hungary		6.1	6.2 (s)	5.4	5.8 (s)	6.5	6.9 (s)	7	6.8 (s)
Malta		3.9	6.3 (s)	6.4	4.6 (s)	4.2	6.5 (s)	8.3	7.7 (s)
Netherlands		6.5	27.1 (s)	26.6	25.8 (s)	28.5	29.7 (s)	28.9	30 (s)
Austria		7.5	8.7 (s)	9.6	10.7 (s)	11.2	11.4 (s)	11.1 (p)	11.5 (s)

EC data browser (Latest commit ddc7ca7a1, built on 2021-09-02T07:35:00.499Z)

https://ec.europa.eu/eurostat/databrowser/view/CEI_SRM030__custom_354994/bookmark/table?lang=en&bookmarkId=c6638243-2f7f-4256-b2fd-6a5159b4b68a

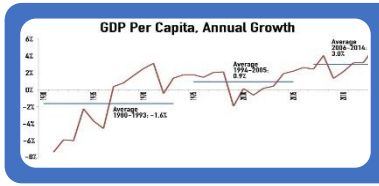
28 European countries

FE and FE instrumental estimators

$$y_{it} = \alpha_0 + \beta X_{it} + \alpha_i + \varepsilon_{it}$$

$$\textbf{Dependent variable} = f(\textbf{Socio} - \textbf{dem characteristis})$$

Dependent variables:
Recycling rate (2000-2018)
and
Circularity rate (2010-2017)



GDP per capita

- Euro

Tertiary

- Tertiary education (levels 5-8)
- Percentage of total 15-64 years old

Fertility rate

- Total fertility rate, the mean number of children that would be born alive to a woman during her lifetime

Urbanization

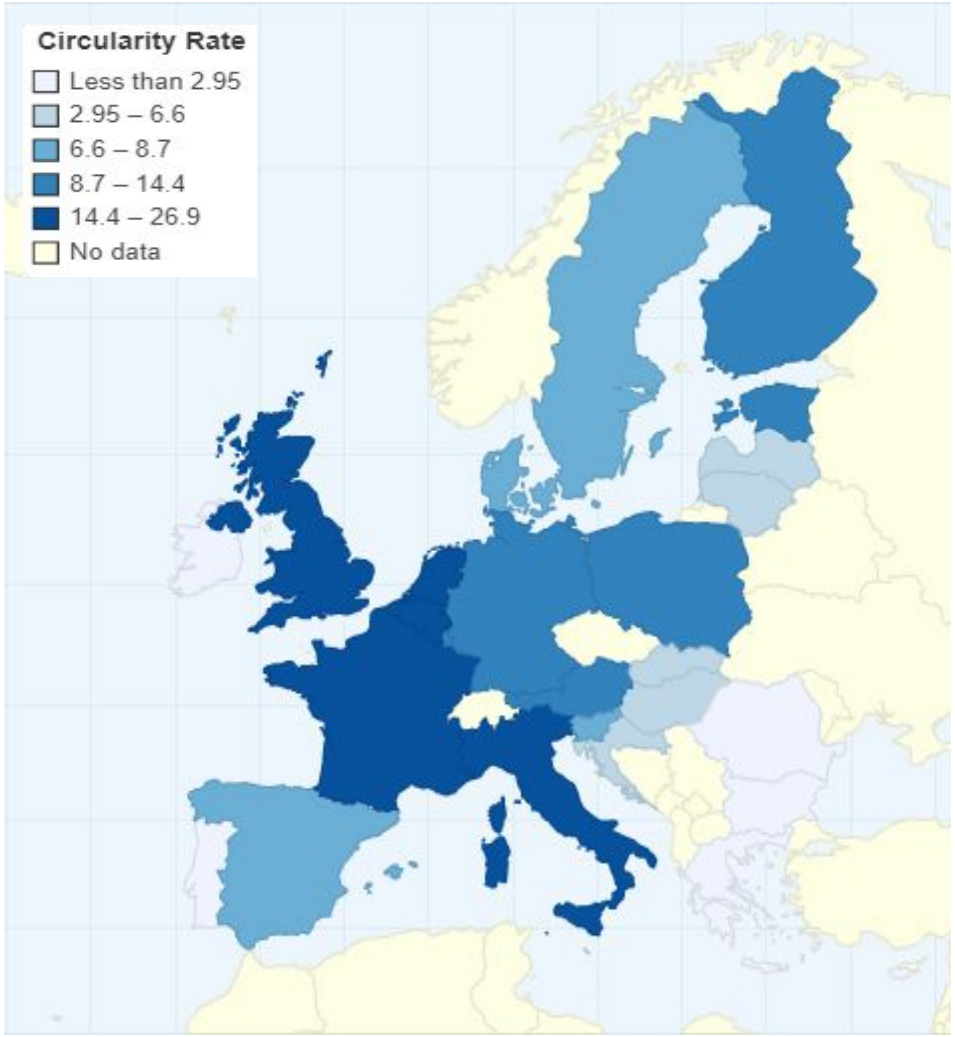
- Distribution of population by degree of urbanization, percentage of people who live in cities

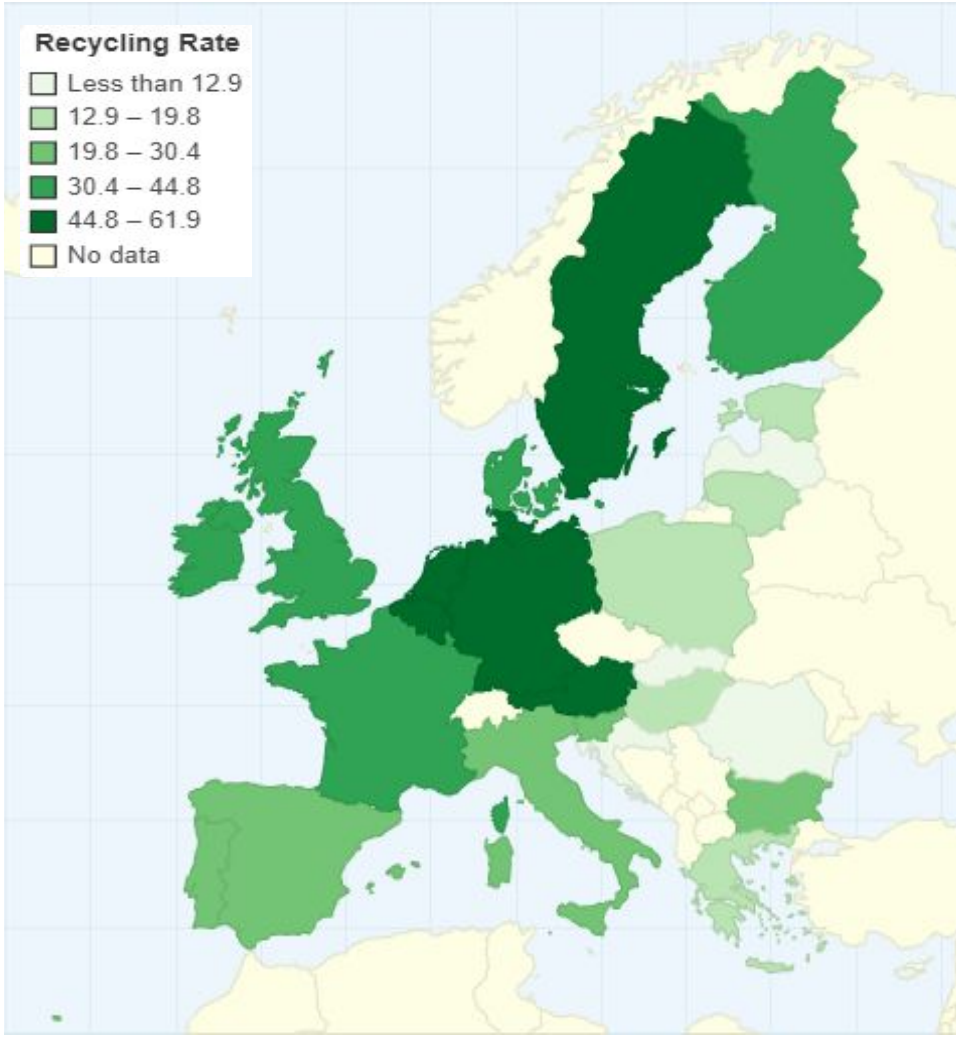
Environmental taxes

- Percentage of total revenues from taxes and social contributions (including imputed social contributions)

R&D expenditures

- Intramural R&D expenditure (GERD) by sectors of performance, all sectors





Quantile classification of EU countries based on their average annual performance on the: (Left) materials' circularity (2010-2017) and (Right) recycling rates (2000-2018)

Table 2: Dependent and independent variables, mean, standard deviation and expected signs

Variables	Definition	Mean	St. dev.	Expected sign
Circularity rate	Circular material use rate	8.56%	6.22%	
Recycling rate	Recycling rate of municipal waste	28.11 %	18.15%	
GDPc	Real GDP per capita	24,213€	15,804€	+
Tertiary	Tertiary education (levels 5-8), Percentage of total 15-64 years old	22.69 %	9.79%	+
Fertility rate	Total fertility rate, the mean number of children that would be born alive to a woman during her lifetime	1.53	0.22	+
Urbanization	Distribution of population by degree of urbanization, percentage of people who live in cities	40.93 %	14.47%	+/-
Environmental taxes	Percentage of total revenues from taxes and social contributions (including imputed social contributions)	7.39%	1.66%	+
R&D	Intramural R&D expenditure by sectors of performance, all sectors	1.45%	0.87%	+

Fixed effect and instrumental variable fixed effect analysis

	Circularity		Recycling	
Variables	fe	fe 2sls	fe	fe 2sls
lnGDPc	4.090*	4.044*	16.545***	17.301***
	(2.260)	(2.270)	(4.233)	(4.318)
Tertiary	0.013	0.013	1.024***	1.086***
	(0.060)	(0.060)	(0.092)	(0.097)
Fertility rate	3.507**	3.537**	18.242***	19.217***
	(1.637)	(1.637)	(3.598)	(3.579)
R&D	6.358***	6.356***	0.616	0.473
	(0.790)	(0.776)	(1.425)	(1.473)
Environmental taxes	0.826***	0.799**	1.379***	1.272***
	(0.267)	(0.391)	(0.397)	(0.488)
Urbanization	0.432***	0.432***	0.238	0.200
	(0.101)	(0.099)	(0.179)	(0.178)
Urbanization^2	-0.005***	-0.005***	-0.003	-0.002
	(0.001)	(0.001)	(0.002)	(0.002)
Constant	-61.96***	-	-202.67***	-
	(21.727)		(39.945)	
Urbanization threshold	41.7%	41.7%	46.8%	45.4%
Hausman		22.29***		76.71***
Anderson canon. corr. LM statistic		87.690***		240.758***
Cragg-Donald Wald F statistic		76.405***		376.867***
Sargan statistic		3.010*		13.319***
Observations	223	223	396	378
R-squared	0.383	0.383	0.533	0.554
Number of countries	28	28	28	28

Main Findings

- **Richer economies**, as expected, seem to take more actions towards recycling and circularity.
- **Higher fertility rate** and **higher education level** indicate …….more likely to carry out **pro-environmental behavior**
- **R&D programs** are essential for the advanced necessary technology of waste and wastewater management, since without scientific research and development several environmental issues may arise
- **Environmental taxes** might also work as an incentive for people and industries to take more actions for protecting the environment
- **As urbanization is raising**, economies of scale lead to higher recycling and circularity rates but with a decreasing trend

The role of entrepreneurship, innovation and socioeconomic development on circularity rate: Empirical evidence from selected European countries

(Under Review)

Ioannis Kostakis

Department of Economics and Sustainable Development, Harokopio University, Greece

Konstantinos P. Tsagarakis

Department of Environmental Engineering, Democritus University, Greece

The present research uses an annual panel data for eighteen (18) selected European economies over the period 2010-2019. Table outlines the specific list of countries for the whole panel.

Panel	Number of countries	List of countries
European countries	18	Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Latvia, Netherlands, Austria, Poland, Portugal, Slovenia, Slovakia, Finland, Sweden, United Kingdom

Data

Variable	Measurement	Proxy of	Source
Circularity rate (C)	Share of material recovered and fed back into the economy	Circularity	Eurostat
Real gross domestic product per capita (GDP)	Ratio of real GDP to the population	Economic growth	Eurostat
Entrepreneurship (E)	Percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business	Formal entrepreneurship	Global Entrepreneurship Monitor
Human Development Index (HDI)	Geometric mean of normalized indices of achievement of long and healthy life (life expectancy), level of knowledge (education) and the level of standard of living (GDP)	Socioeconomic development	United Nations
Research and Development expenditures (RD)	Research and development expenditure within the business enterprise sector as a share of GDP	Innovation	Eurostat **DATASET**
Gas emissions (GAS)	Thousand tones per capita	"Polluting" entrepreneurship	European Environment Agency
Foreign direct investments, inflows	The objective of obtaining a lasting interest by an investor in one economy in an enterprise resident in another economy	Financial development	Eurostat

Methodology

18 economies

$$lnC_{it} = \beta_0 + \beta_1 lnE_{it} + \beta_2 lnD_{it} + \beta_3 lnRD_{it} + \beta_4 lnFD_{it} + \beta_5 lnGAS_{it} + \varepsilon_{it} \quad (1)$$

- Cross sectional dependence
- Unit root tests
- Cointegration tests
- Long-run equation

Empirical analysis

Descriptive statistics

Country	Mean C	Std.dev C	Mean GDP	Std.dev GDP	Mean RD	Std.dev RD	Mean E	Std.dev E	Mean HDI	Std.dev HDI	Mean FD	Std.dev FD	Mean GAS	Std.dev GAS
1.Germany	11.28	0.60	34,135	1264.2	14.51	1.76	5.25	0.94	0.94	0.006	2.19	1.04	9,389	608
2.Estonia	13.47	2.76	13,366	1,425	27.52	2.46	15.56	3.73	0.87	0.01	5.68	4.23	14,556	1,657
3.Ireland	1.78	0.17	45,853	9,435	8.71	2.01	8.71	2.03	0.93	0.02	1.13	0.65	11,673	1,463
4.Greece	2.45	0.83	17,461	1,056	15.21	2.94	6.52	1.17	0.87	0.008	1.13	0.65	7,815	682
5.Spain	9.10	1.03	23,333	1,195	16.00	1.76	5.62	0.61	0.89	0.01	2.41	0.86	5,926	305
6.France	18.29	1.19	31,734	834	14.51	1.91	5.24	0.64	0.89	0.007	1.46	0.62	5,315	302
7.Croatia	3.94	1.14	10,977	784	27.41	1.30	8.24	1.33	0.84	0.01	2.00	1.47	4,617	278
8.Italy	16.07	2.85	26,278	628	16.43	2.00	3.90	0.85	0.88	0.004	0.98	0.58	5,814	536
9.Latvia	4.14	1.81	10,615	1280	36.99	3.16	13.45	1.64	0.85	0.01	2.96	1.24	5,534	342
10.Netherlands	27.2	1.64	39,550	1,353	5.72	1.47	9.53	1.63	0.93	0.008	19.08	20.62	10,527	439
11.Austria	9.67	2.04	36,588	839	32.91	0.89	9.76	0.78	0.91	0.007	-0.09	3.92	7,120	347
12.Poland	10.61	1.06	10,910	1,184	11.17	0.83	8.47	1.86	0.86	0.01	2.72	1.17	9,470	215
13.Portugal	2.10	0.26	17,018	869	28.14	2.95	9.04	2.40	0.85	0.01	4.56	2.48	5,384	225
14.Slovenia	8.74	1.30	18,461	1,238	21.91	0.74	6.15	1.33	0.90	0.01	1.98	1.30	7,379	419
15.Slovakia	4.98	0.51	14,086	1,123	11.69	2.14	11.24	1.74	0.85	0.009	2.63	1.89	6,740	293
16.Finland	8.97	3.92	35,518	979	37.83	3.70	6.20	0.52	0.93	0.007	2.40	3.92	10,562	1,316
17.Sweden	7.10	0.49	41,957	1,517	51.55	3.04	6.92	1.05	0.93	0.01	1.50	2.11	5,176	483
18.United Kingdom	14.93	1.08	31,348	1,155	7.58	3.02	8.22	1.29	0.92	0.009	3.12	3.32	6,777	936

Empirical analysis

Cross sectional dependency test, first and second generation panel unit root tests

Variables	CD statistic	Im et al.		Hadri		CIPS	
		Level	Δ	Level	Δ	Level	Δ
lnC	4.89***	-1.191	-1.953**	12.457***	0.784	-2.506	-2.855***
lnE	10.22***	-0.879	-6.518***	6.097***	-1.590	-3.108*	-3.550***
lnGDP	28.19***	4.769	-5.734***	18.954***	4.928***	-1.951	-2.050**
lnrRD	1.20	-0.697	-0.874	13.707***	-0.230	-1.928	-2.690***
lnHDI	36.23***	3.545	-3.566***	20.161***	-0.842	-2.583	-2.627**
lnFD	-0.13	-0.279	-3.518***	2.231**	-2.034	-2.529	-3.229***
lnGAS	14.65***	-0.778	-2.791***	5.115***	0.558	-2.373	-2.683***

Notes: CD-test: Under the null hypothesis of cross-section independence CD ~ N(0,1)

Empirical analysis

Table. Pedroni (1999, 2004) and Westerlund (2005) cointegration test results

Pedroni	Modified Phillips-Perron t	Phillips-Perron t	Augmented Dickey-Fuller t
Statistic	5.1353***	-14.078**	-0.000***
Statistic	5.296***	-9.762***	0.000***
Westerlund	Variance ratio		
Statistic	3.769***		
Statistic	4.737***		

Empirical analysis

Table. Empirical results

Variables	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[7]	[8]	[9]	[10]
lnE	0.091***	0.073**	0.066*	0.082**	0.081**	0.239**	0.351***	0.273**	0.252**	0.227*	0.269**	0.271*
	(0.035)	(0.032)	(0.035)	(0.038)	(0.038)	(0.109)	(0.128)	(0.122)	(0.126)	(0.133)	(0.131)	(0.128)
lnGDP		0.579***	0.545***	0.517***	-	-	0.783***	0.924***	-	-	0.844**	0.925***
		(0.170)	(0.166)	(0.173)			(0.308)	(0.318)			(0.309)	(0.320)
lnRD			0.582***	0.573***	0.524***	0.776*	0.741***	0.747***	0.593***	0.620***	0.560**	0.743***
			(0.097)	(0.104)	(0.107)	(0.454)	(0.211)	(0.196)	(0.202)	(0.196)	(0.231)	(0.210)
lnFD				-0.000	0.005	-0.013	-0.029	-0.023	-0.040	-0.026	-0.047*	-0.023
				(0.008)	(0.008)	(0.023)	(0.026)	(0.027)	(0.026)	(0.028)	(0.028)	(0.028)
lnHD					2.888***	6.419**	-	-	6.293***	5.035***	-	-
					(0.830)	(2.965)			(1.891)	(2.052)		
lnGAS											-0.519*	-0.017
											(0.312)	(0.301)
Constant	2.273***	-3.738**	-3.999**	-3.722**	1.907***	1.738***	-	-	-	-	-	-
	(0.063)	(1.764)	(1.734)	(1.803)	(0.156)	(0.633)	-	-	-	-	-	-
Specification	FGLS	FGLS	FGLS	FGLS	FGLS	MG	FMOLS	DOLS	FMOLS	DOLS	FMOLS	DOLS
Obs.	174	174	174	162	162	162	162	162	162	162	162	162
Number of groups	18	18	18	18	18	18	18	18	18	18	18	18

Main Findings

- **Formal entrepreneurship, innovation, economic growth and socioeconomic development can be important contributors to circular economy in Europe.**
- **Entrepreneurship positively affects circularity rate among European economies validating that entrepreneurship in developed countries consists of an important contributor of the sustainable development system.**
- **On the contrary "polluting" entrepreneurship proxied by the total gas emissions per capita seems to be negative.**
- **Income per capita has a highly significant and positive affiliation respectively with circularity rate confirming that richer economies circulate materials in a higher level than less income developed countries.**
- **Similarly, human development index that is used as an alternative variable of income per capita in our analysis, is also evidenced to enhance circularity rate.**
- **Technological innovation was found to highly promote sustainability process via a higher level of circularity rate in Europe.**
- **Financial development proxied by foreign direct investment seems to insignificantly affects circularity in Europe.**

LinkedIn and Circular Economy: European companies' engagement in circular economy

GeorgiosTsironis, Theodoros Daglis, Konstantinos P. Tsagarakis

Department of Environmental Engineering, Democritus University, Greece

Introduction

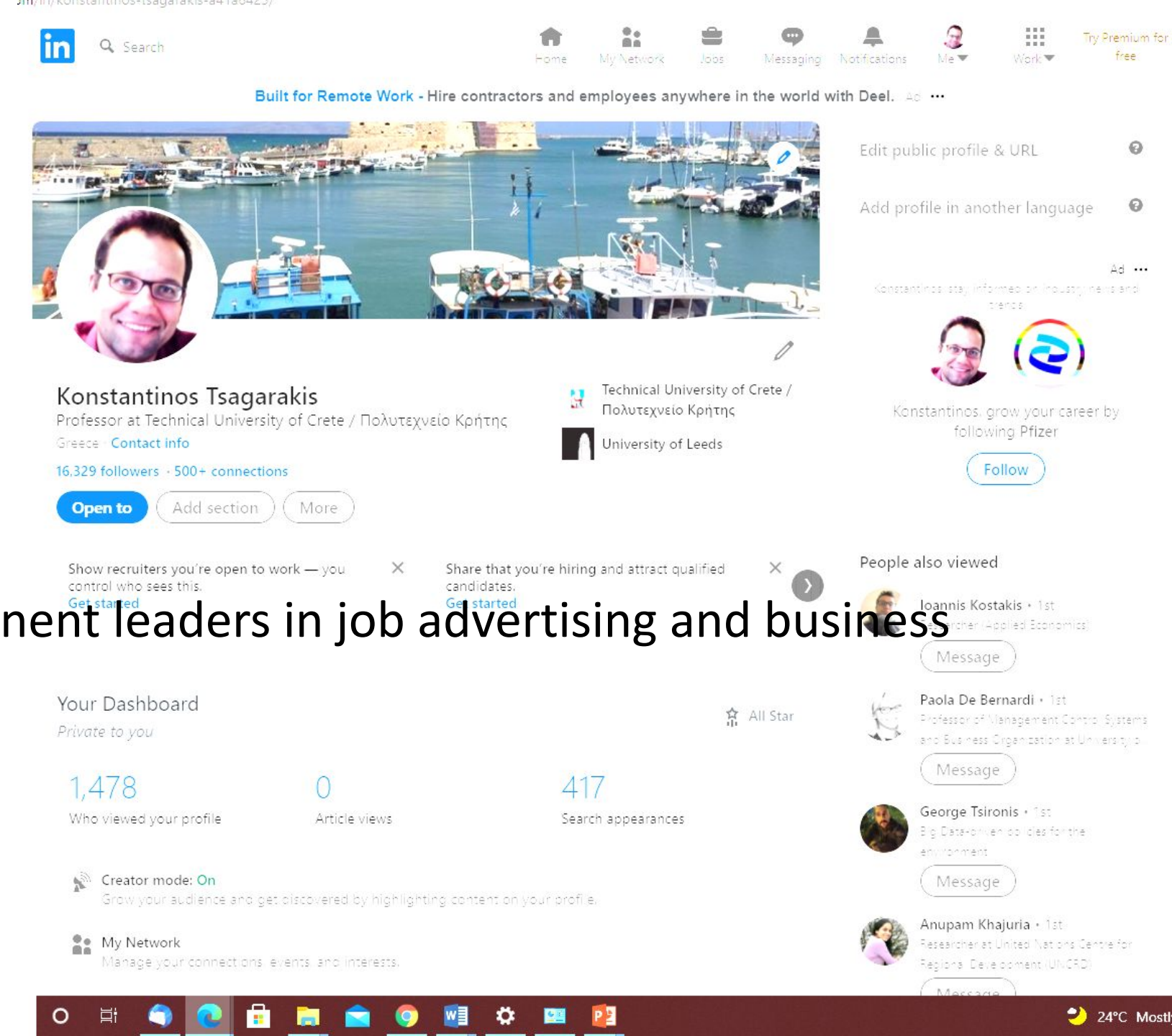
Aim of this work:

- Data-driven approach of Circular Economy as an activity and a trend in companies located in Europe.
- We provide evidence for each country’s engagement in Circular Economy regarding the business sector.
- We test whether the multitude of the Circular Economy companies is distributed differently among the examined European countries.

Data Source

Why LinkedIn?

- Data volumes
- Free-of-charge use
- One of the most prominent leaders in job advertising and business profiling
- Semi - structured data
- Open data



Methodology

- 4.048 companies' data, from 28 European countries, have been extracted and analysed from LinkedIn.
- The search term was ***circular economy***
- ***Companies*** filter was selected
- The search was applied on 28 European countries
- For each country there was a resulting number of companies related to circular economy (including the term in their description)

Text Mining

- We used Linked Helper 2, as an external tool for automated mining.
- Listed companies were placed in a queue.
- Each sector of each company's profile page was transformed into csv formatted cells.
- The resulting csv file for each country included rows, corresponding to each company and columns with the company's data.
- The process was repeated for the 28 countries

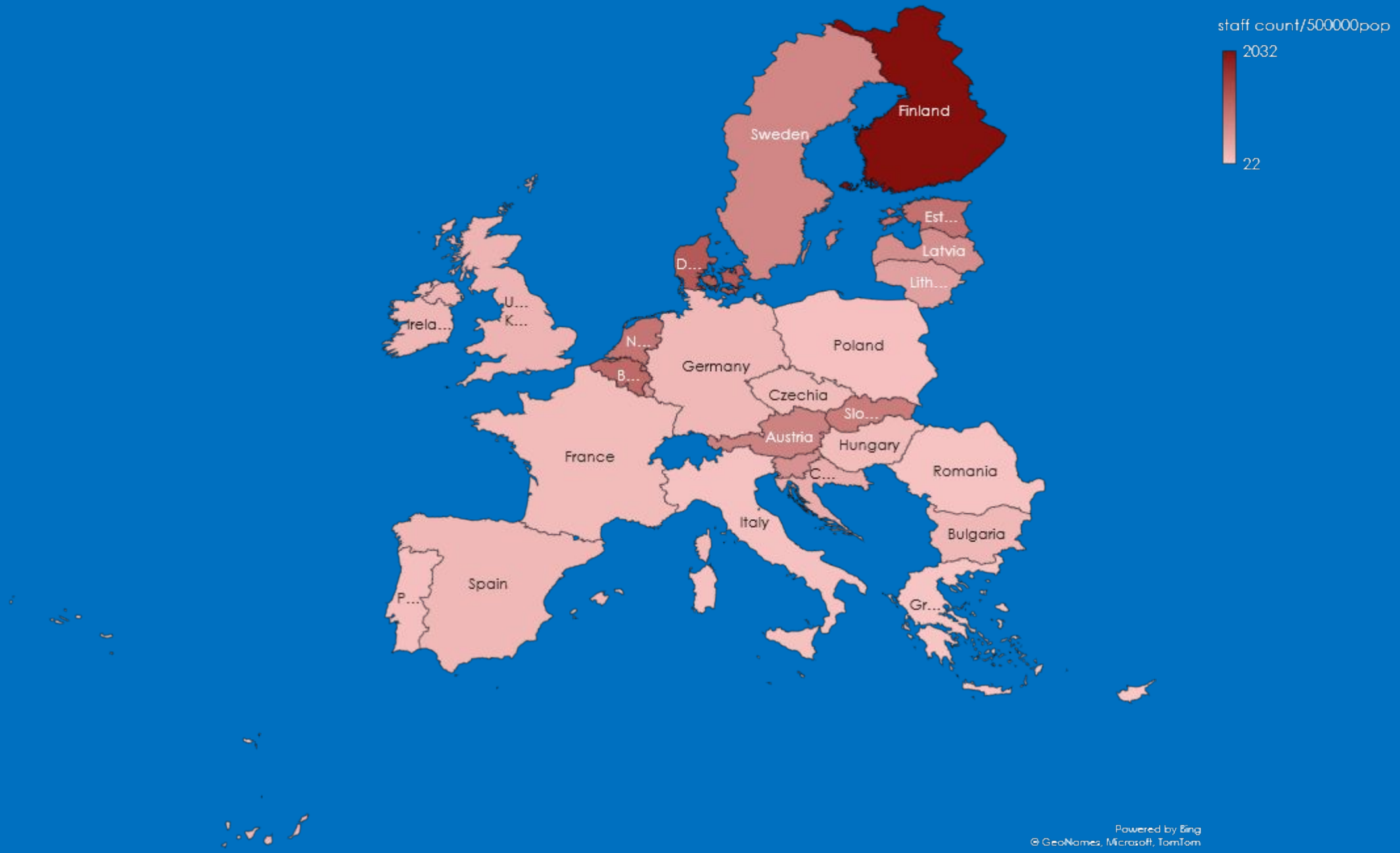
Data Processing

Csv files were loaded as excel (.xlsx) format

Only a few columns were needed for our analysis:

- Staff_count
- Founded_on
- industry

Employees of Companies related to Circular Economy per 500.000 population

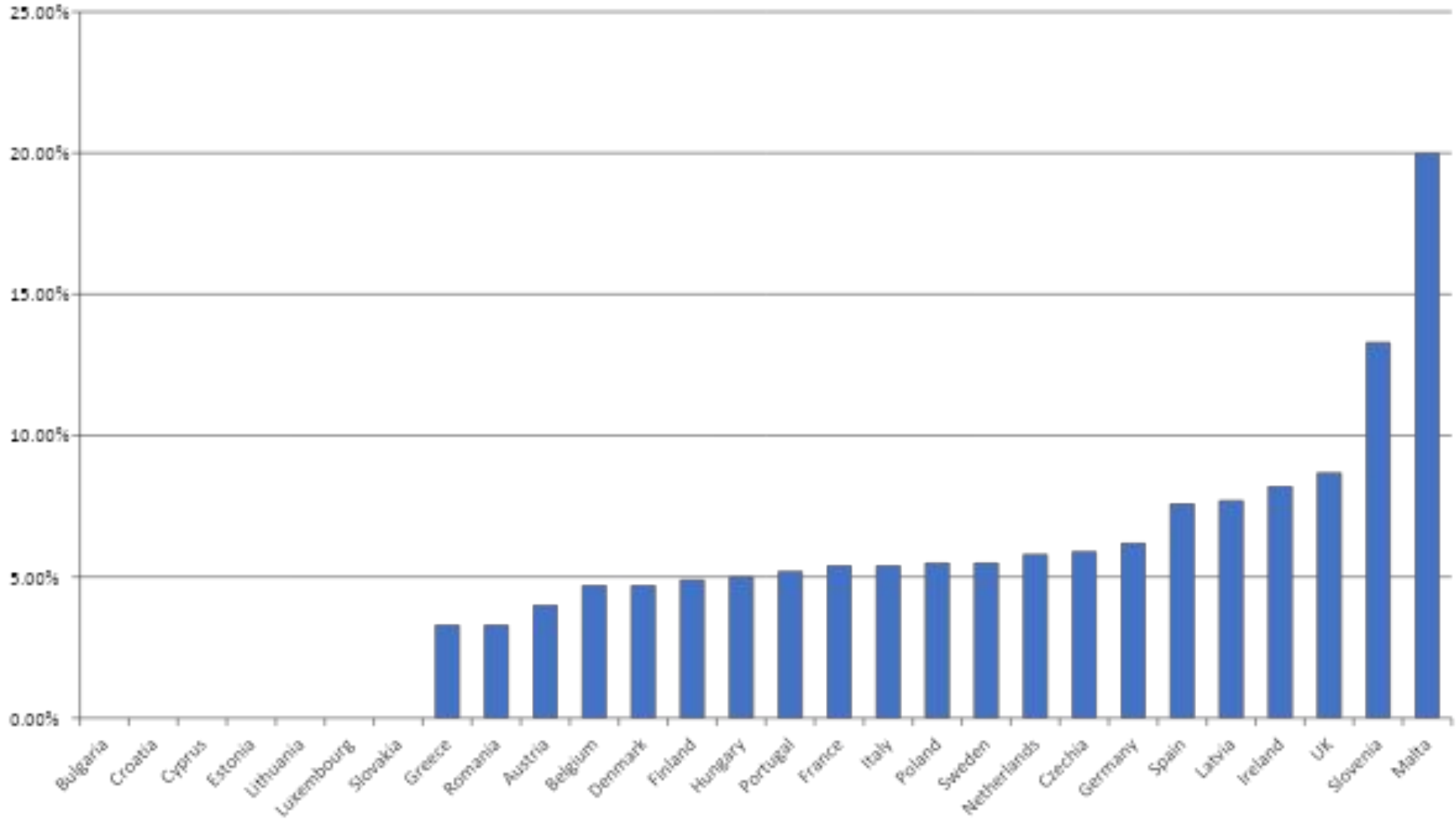


Data Processing

- We focused on the industry categorization of the companies
- Each company included a column describing the industry sector it belongs to.
- The total number of industry tags was 123 (all companies in every country)
- The industry sectors were regrouped in 7 major categories (input-output)
- Company types are differently distributed among the countries (X^2=196.060, p=0.035).

Agricultural and Food related activities
Construction, Manufacture, Mining
Environment
Finance, Insurance and Real Estate
Government, Social Services, Entertainment
ICT service activities
Transportation

Country	Agricultural and Food	Construction, Manufacture, Mining	Environ-ment	Finance Insurance and Real Estate	Government, Social Services, Entertainment	ICT serviceactivities	Trans-portation
Greece	2(3.3%)	6(9.8%)	27(44.3%)	6(9.8%)	6(9.8%)	14(23%)	0
France	14(5.4%)	52(21%)	78(30.1%)	9(3.5%)	28(10.8%)	69(26.6%)	9(3.5%)
Italy	20(5.4%)	106(28.6%)	97(26.2%)	9(2.4%)	48(12.8%)	79(21.3%)	11(3%)
Austria	3(4%)	18(24%)	23(30.8%)	1(1.3%)	7(9.3%)	19(25.3%)	4(5.3%)
Belgium	15(4.7%)	65(20.6%)	81(25.6%)	8(2.5%)	54(17.1%)	79(25%)	14(4.4%)
Bulgaria	0	3(15%)	10(50%)	0	3(15%)	4(20%)	0
Croatia	0	2(18.2%)	4(36.4%)	0	0	4(36.4%)	1(9.1%)
Cyprus	0	0	3(30%)	0	1(10%)	5(50%)	1(10%)
Czechia	2(5.9%)	11(32.3%)	4(11.8%)	4(11.8%)	3(8.8%)	9(26.5%)	1(2.9%)
Denmark	7(4.7%)	31(20.81%)	48(32.21%)	2(1.34%)	15(10.07%)	43(28.86%)	3(2.01%)
Estonia	0	6(33.3%)	5(27.8%)	0	3(16.7%)	3(16.7%)	1(5.6%)
Finland	8(4.9%)	33(20.2%)	48(29.4%)	7(4.3%)	21(12.9%)	39(23.9%)	7(4.3%)
Germany	21(6.2%)	80(23.5%)	65(19.1%)	8(2.3%)	46(13.5%)	113(33.2%)	7(2.1%)
Hungary	1(5%)	5(25%)	9(45%)	0	2(10%)	3(15%)	0
Ireland	6(8.2%)	13(17.8%)	28(38.4%)	2(2.7%)	8(11%)	13(17.8%)	3(4.1%)
Latvia	1(7.7%)	1(7.7%)	3(23.1%)	1(7.7%)	3(23.1%)	4(30.8%)	0
Lithuania	0	3(27.3%)	4(36.4%)	0	0	2(18.2%)	2(18.2%)
Luxembourg	0	8(22.9%)	8(22.9%)	4(11.4%)	6(17.1%)	9(25.7%)	0
Malta	1(20%)	1(20%)	2(40%)	0	0	1(20%)	0
Netherlands	33(5.8%)	140(24.5%)	166(29%)	22(3.8%)	74(12.9%)	125(21.8%)	12(2.1%)
Poland	4(5.5%)	11(15.1%)	24(32.9%)	1(1.4%)	13(17.8%)	17(23.3%)	3(4.1%)
Portugal	6(5.2%)	31(26.7%)	29(25%)	2(1.7%)	13(11.2%)	33(28.5%)	2(1.7%)
Romania	1(3.3%)	6(20%)	8(26.7%)	2(6.7%)	5(16.7%)	7(23.3%)	1(3.3%)
Slovakia	0	2(9.5%)	8(38.1%)	1(4.8%)	4(19.1%)	5(23.8%)	1(4.8%)
Slovenia	4(13.3%)	8(26.7%)	3(10%)	0	6(20%)	9(30%)	0
Spain	23(7.6%)	83(27.3%)	72(23.7%)	9(3%)	35(11.5%)	74(24.3%)	8(2.6%)
Sweden	8(5.5%)	30(20.7%)	35(24.1%)	5(3.5%)	21(14.5%)	43(29.7%)	3(2.1%)
UK	74(8.7%)	195(23%)	236(27.8%)	38(4.5%)	101(11.9%)	180(21.2%)	25(2.9%)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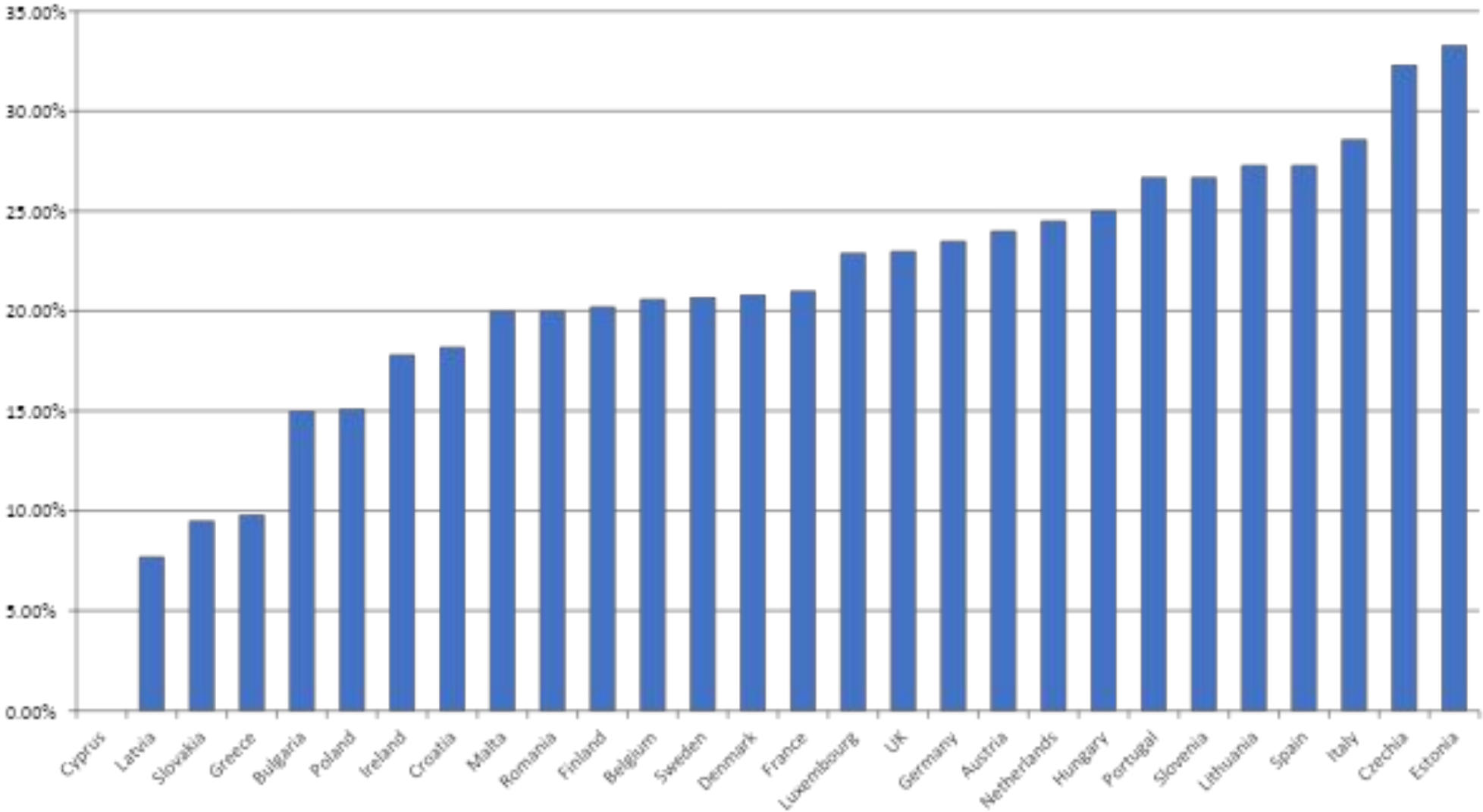
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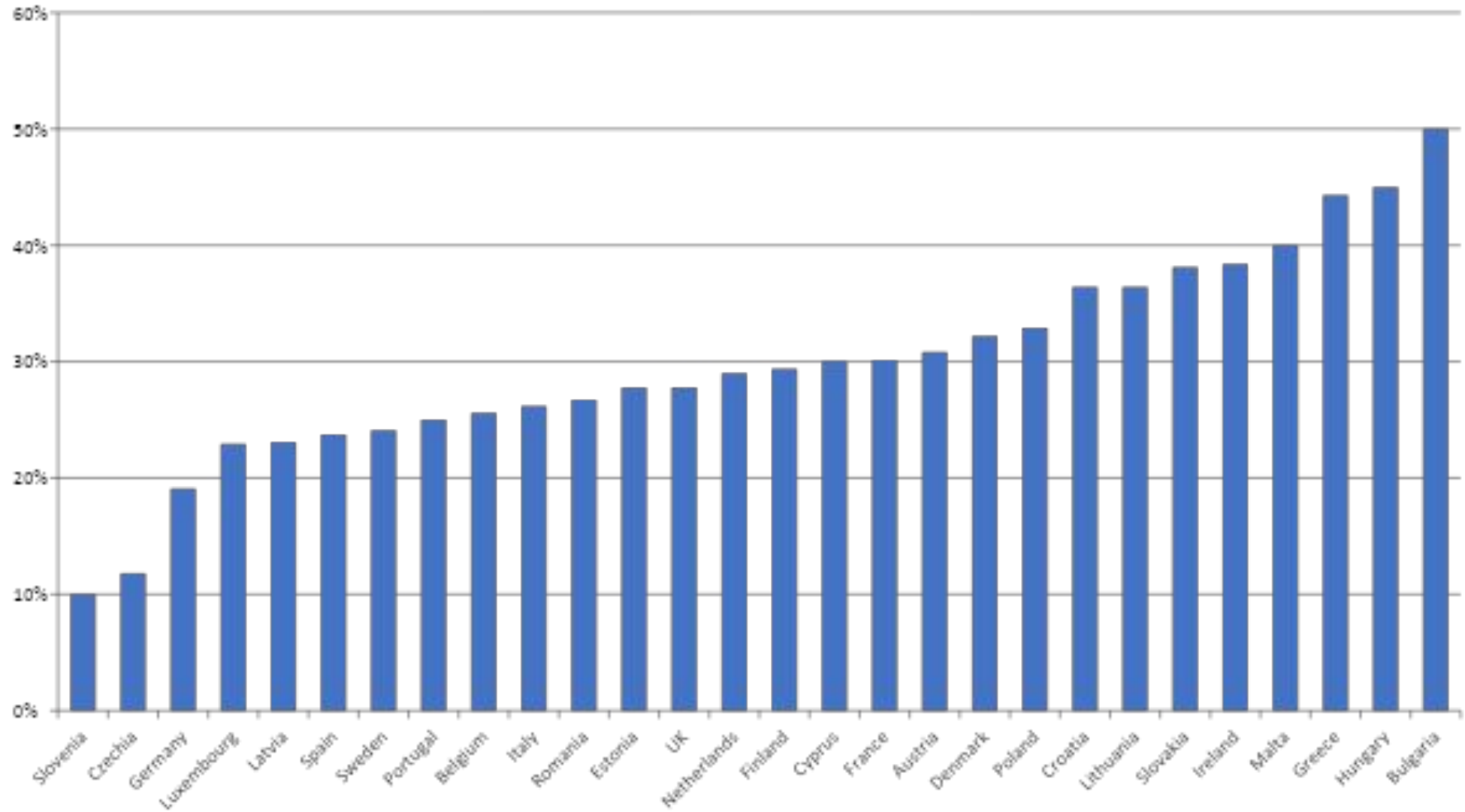
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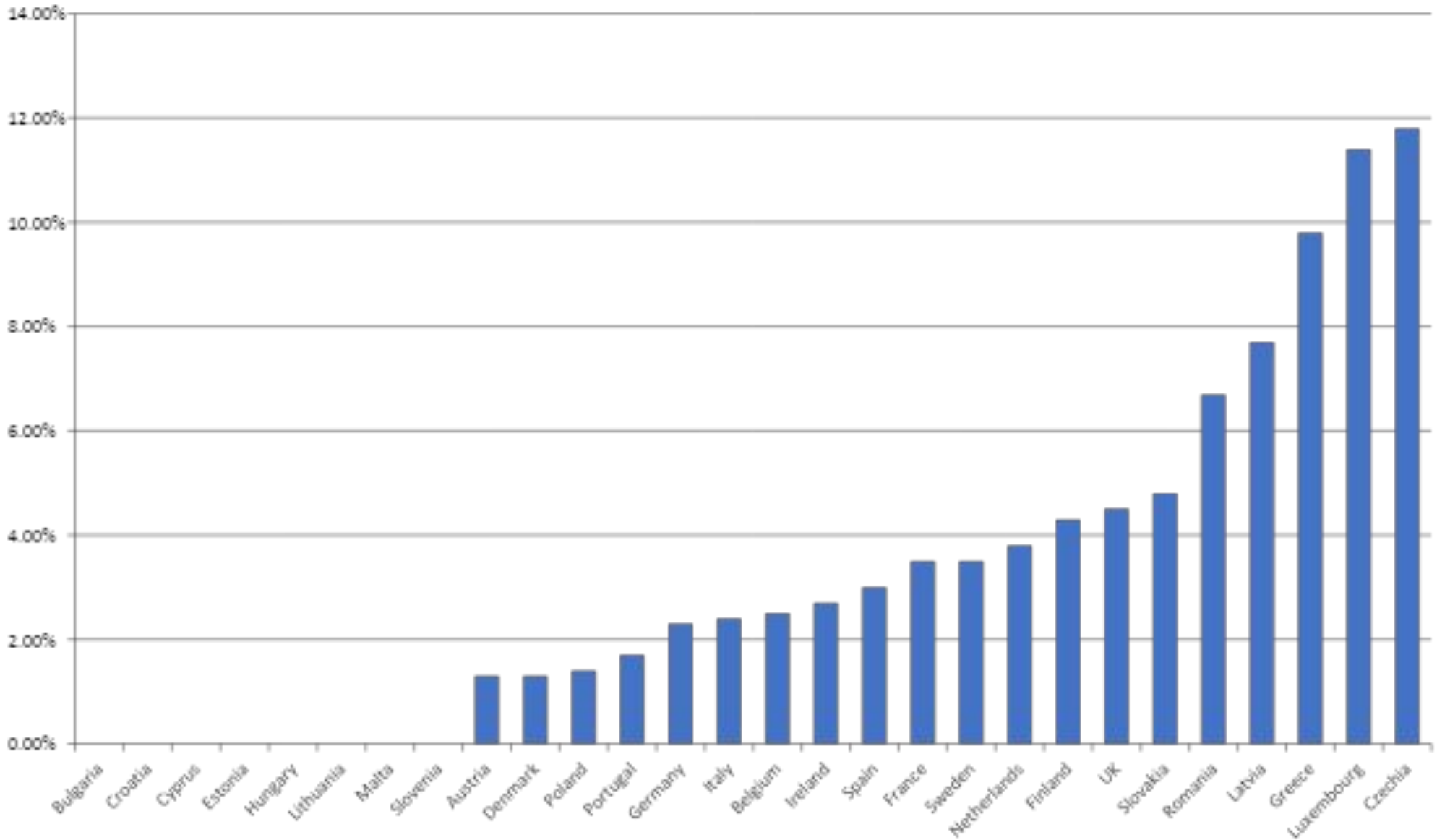
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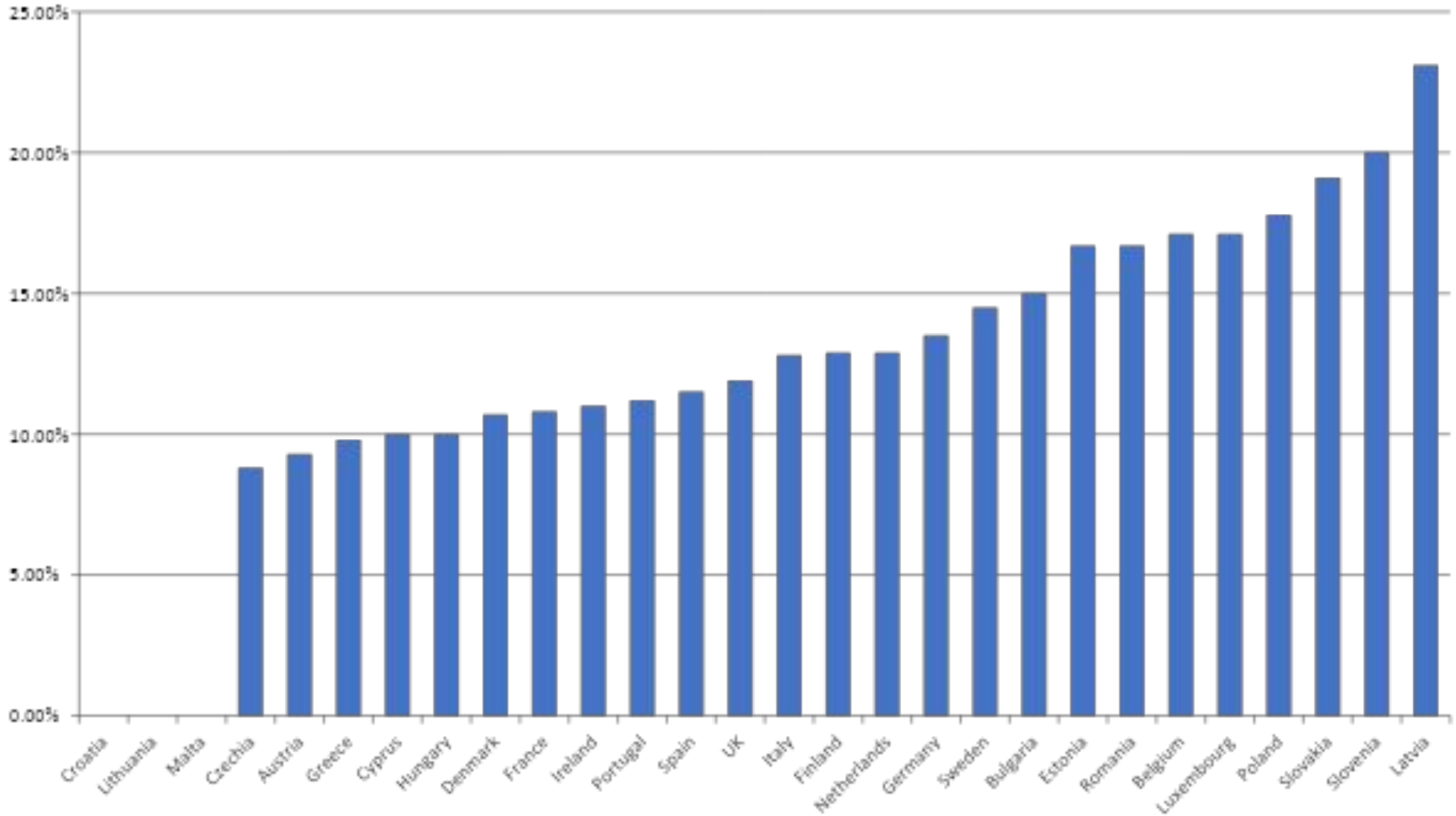
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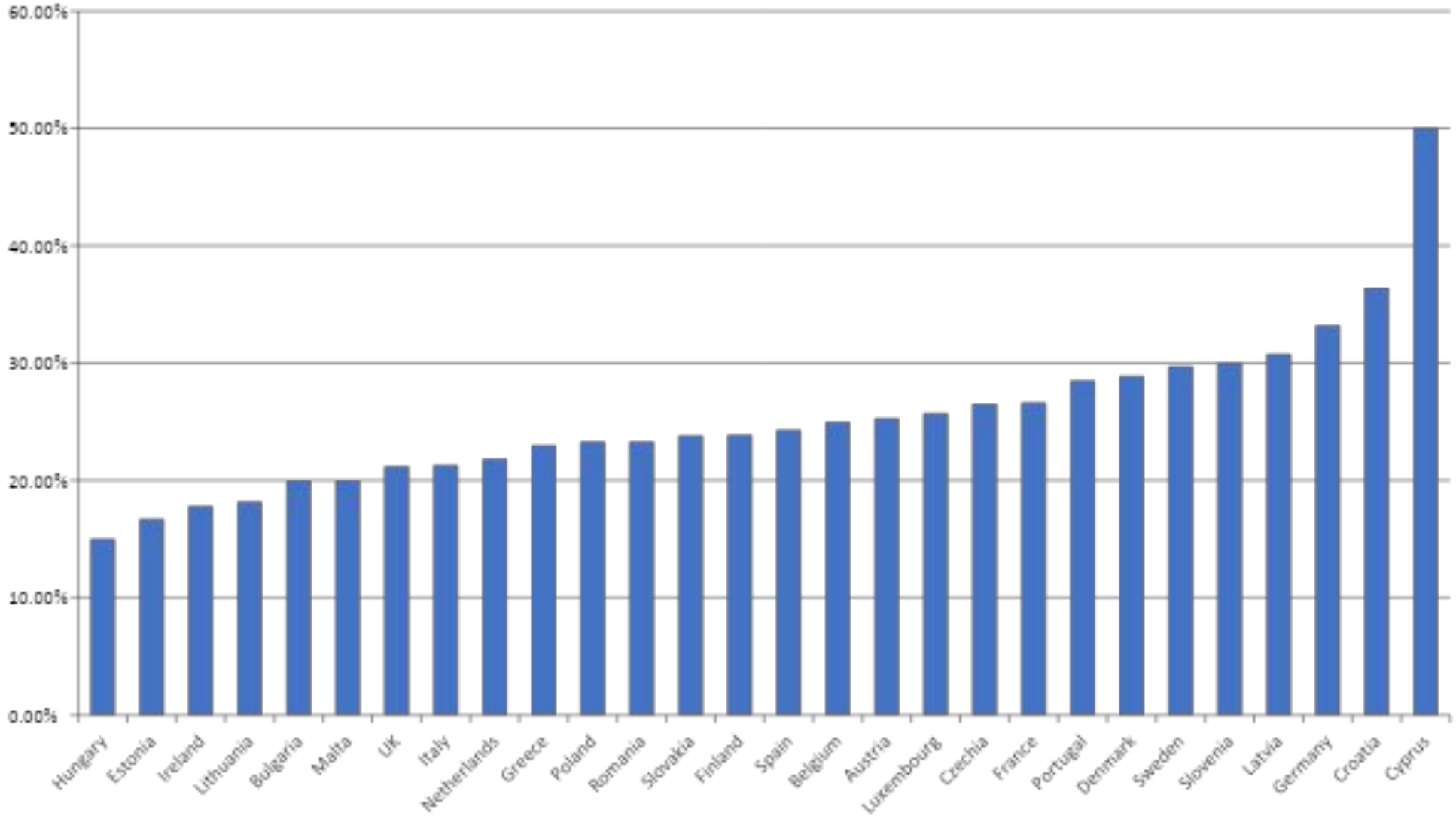
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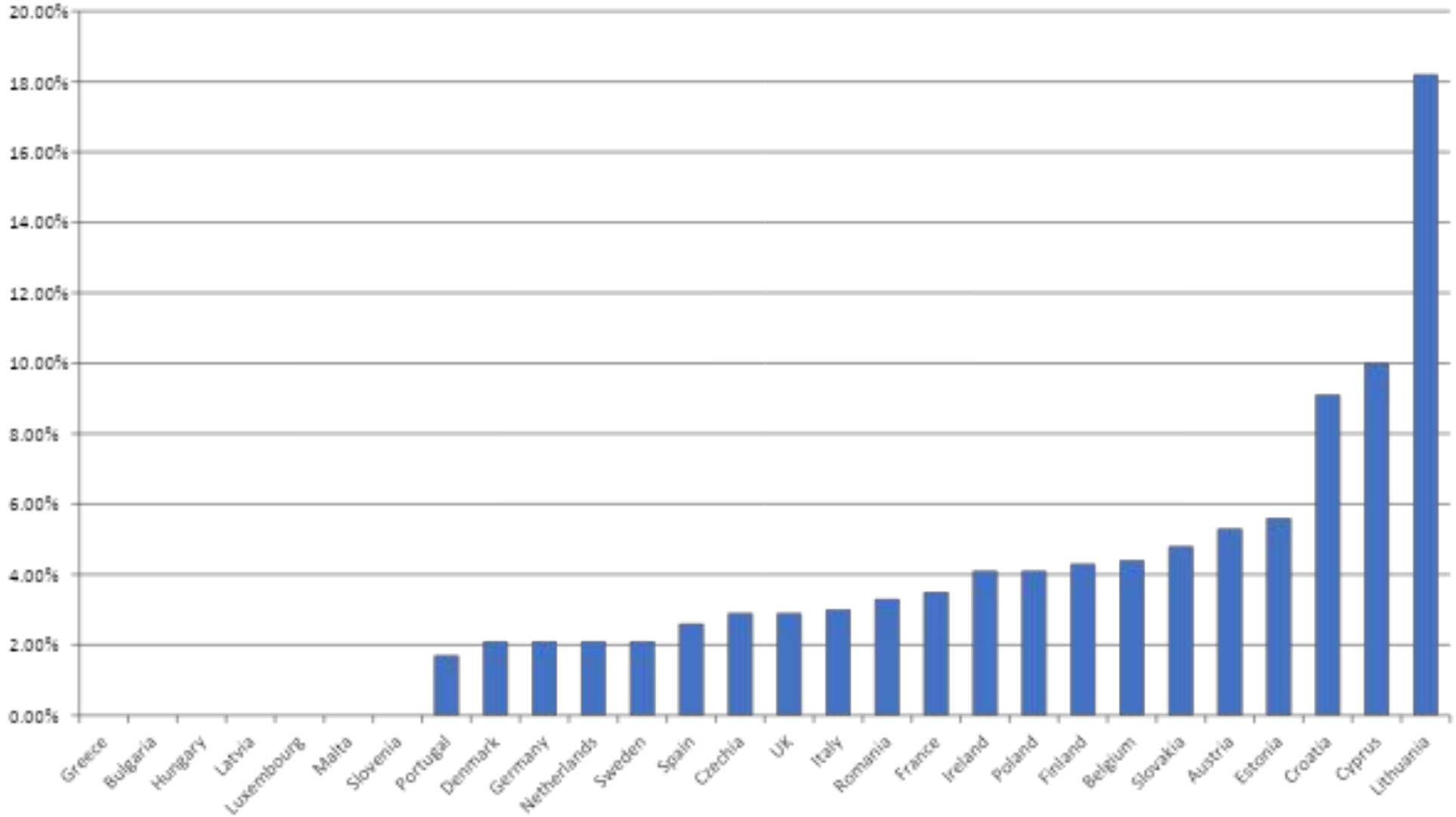
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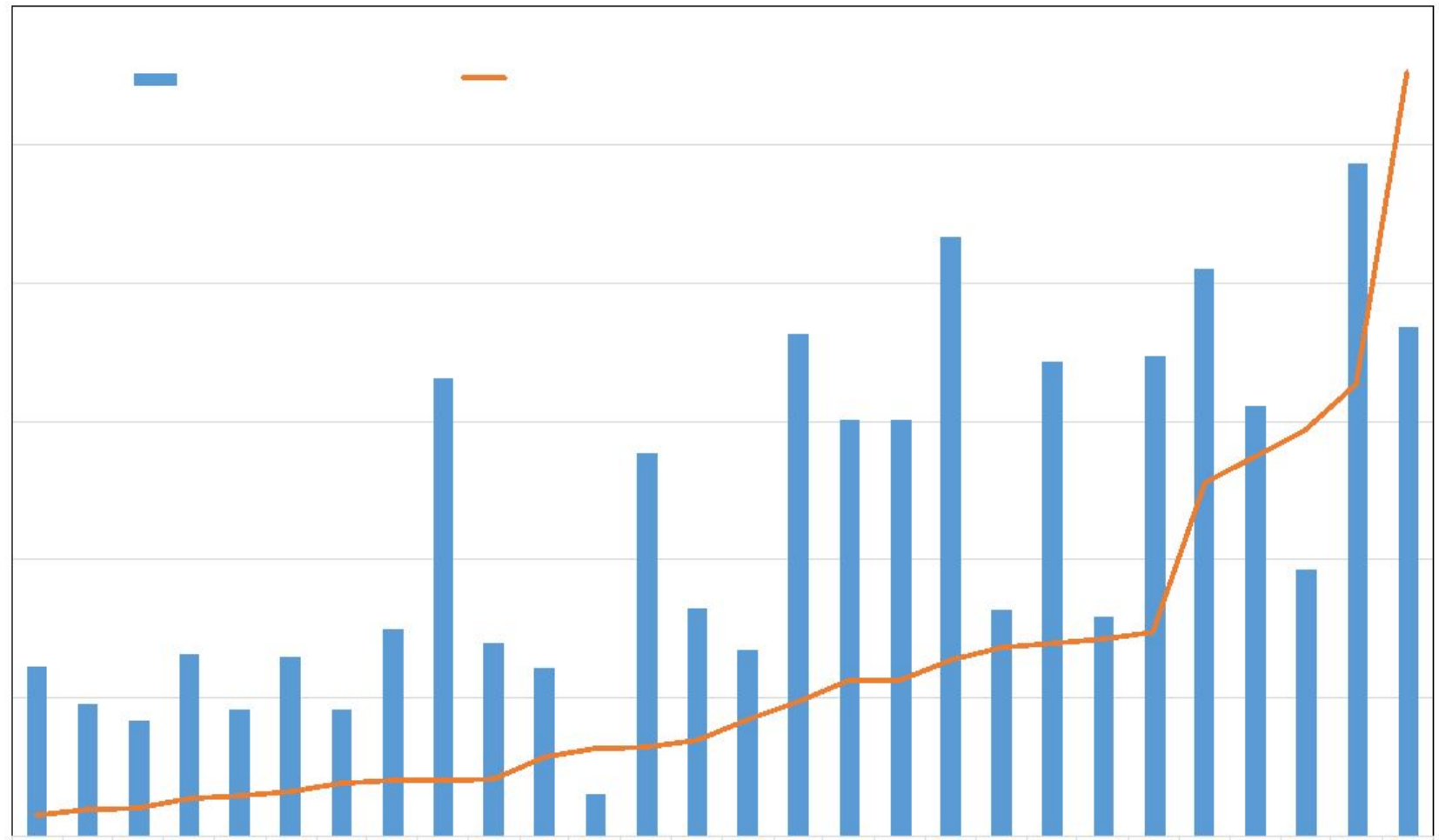
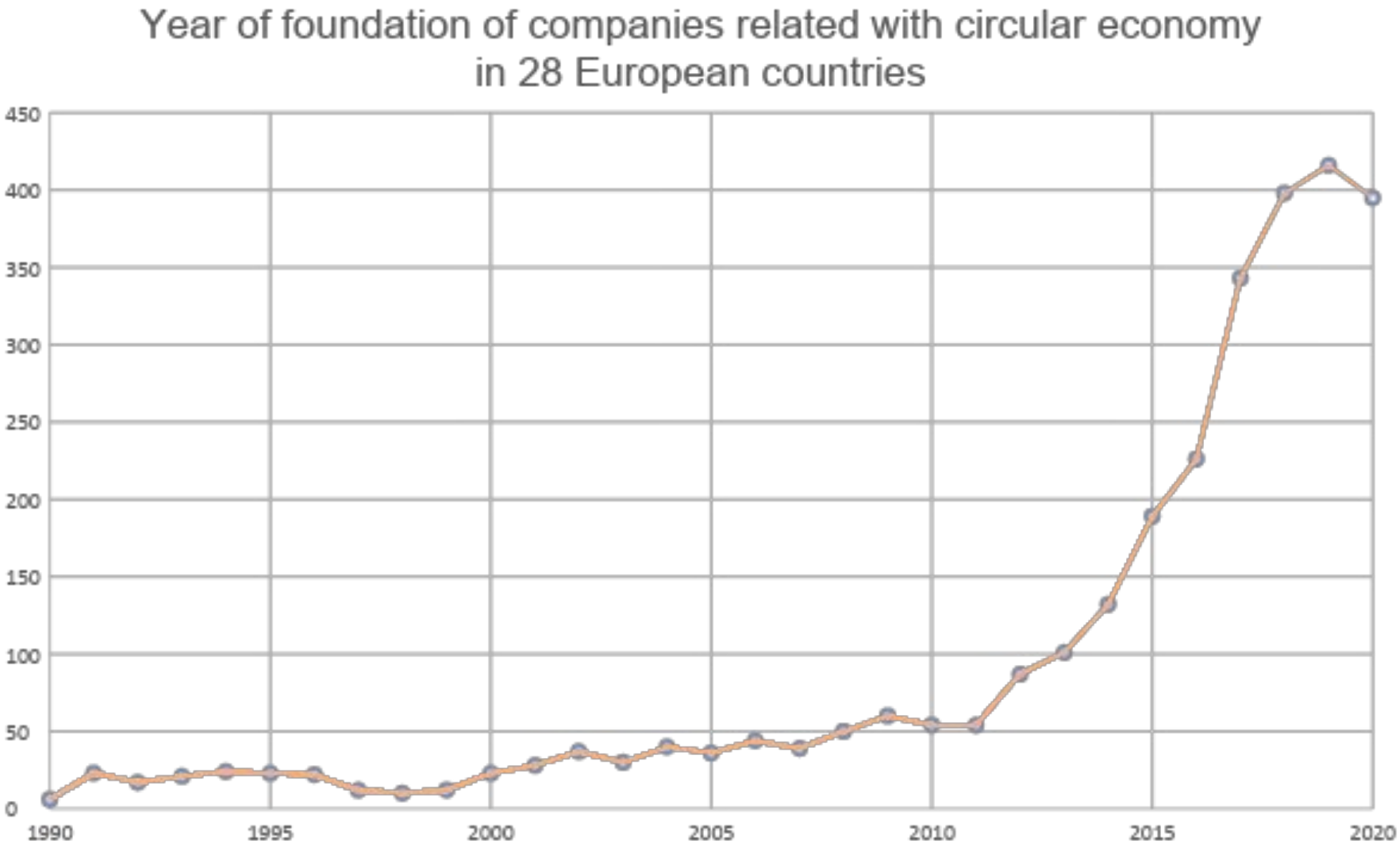


Companies’ Year of Foundation

- The Founded_on column analysis indicates that 2019 was the year with the most foundations of companies related to CE, among European countries.
- We took into consideration only the last 30 years (1990 – 2020)


Year of foundation of companies related with circular economy in 28 European countries
450
400
350
300
250
200
150
100
50
0
1990
1995
2000
2005
2010
2015
2020

Conclusions

- Each country showed a different distribution of companies in the designated industry categories.
- CE can be combined with many business and industry sectors, raising a company's diversity and adaptability against the new environmental demands.
- A supplementary python 3.9 analysis on the ***specialities*** column resulted in the following Word Cloud which demonstrates a wide range of companies' activities related to CE.


Sustainability
Environment
Technology
Circular
engineering
Waste
material
Recycling
Waste Management
Solution
Product
Consulting
Sustainable Development
Innovation
Sustainable
Energy
Design
Education
Plastic
food
Service
communication
Business
Economy
Environmental
Social
reuse
Packaging
Development
System
Building
Climate Change
Business Model
Industrial
supply chain
marketing
Digital
Cradle
entrepreneurship
Project management
Green Economy
Electronic
Energy Efficiency
production
Business Development
Training
Agriculture
Strategy
Sustainability Innovation
consultancy
fashion
Construction
Green
research
Water
Management
Renewable energy
Zero Waste
Policy
Recycled
Retail
Brand
process
Eco
textile
Renewable
Bio
Event
Networking
startup
Coaching
Corporate
Data
Infrastructure
Health
Community
Product Design
Workshop
Leadership
Life Cycle
Resource Efficiency
Urban
Network
repair
Change management
RECYCLING Waste
Architecture
carbon
de
analysis
Chemical
Project
SDG
industry
Circular Design
biotechnology
Compliance
Social Media
Local
CSR
Gas
Investment
Mobility
Cleantech
Ecosystem
food waste
Blockchain
Paper
furniture
Smart
raw material
Manufacturing
design thinking
Cycle Assessment
upcycling
sustainable fashion
Climate
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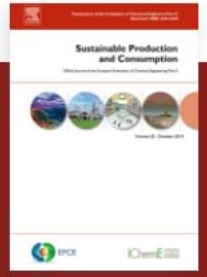

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Sustainable Production and Consumption

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Special Issue on Circular Economy as a Driver for Achieving Sustainable Production and Consumption

August 2021

Socio-economic progress and development has led to various environmental impacts, including climate change, which has in turn prompted international actions to identify sustainable solutions at a global level. The 2030 Agenda is a program to achieve a sustainable transition and SDG 12 aims to ensure sustainable consumption and production patterns. Therefore, the aim is to provide everyone with access to, among other, water, food and energy by reducing the excessive use of natural resources.

The concept of circular economy is proposed as a model that can reconcile economic growth with the consumption of natural resources and SDG target 12.5 aims to "substantially reduce waste generation through prevention, reduction, recycling and reuse" by 2030. This model pursues economic opportunities while limiting environmental impacts and reducing resource use, with efficient waste management, waste prevention and resource efficiency. This change affects businesses that seek to maintain the value of materials, resources and products as long as possible within the economic system. Likewise, it is an opportunity for people to become an active part in the change through more responsible consumption.

The purpose of this special issue is to show how the circular economy contributes to the achievement of SDG12 using a multidisciplinary perspective on research and practice across sectors. Potential authors are encouraged to submit high-quality original empirical, quantitative, and conceptual research papers on how the circular economy can contribute to sustainable production and consumption. Topics include, but are not limited to:

- Analysis of investments/profitability in circular projects
- Assessing the perspective of businesses and consumers on the circular economy in different sectors

Special Issue open for submissions

https://www.journals.elsevier.com/sustainable-production-and-consumption/call-for-papers/special-issue-on-circular-economy-as-a-driver-for-achieving-sustainable-production-and-consumption

- Assessing the perspective of businesses and consumers on the circular economy in different sectors
- Circular business models for sustainable production and consumption
- Circular economy and social innovation
- Circular economy and sustainable supply chain systems
- Circular economy engagement and consumers' willingness to pay for circular products
- Circular economy indicators, decision support and assessment approaches
- Environmental impacts of circular products and developments
- Measurement of circular performance on a life cycle basis
- Policies to implement new production and consumption patterns from a circular perspective.
- Product labels for circular economy and sustainability
- Reverse logistics and circular supply chains to facilitate the transition to the circular economy
- Social analysis of responsible consumption towards different circular strategies
- Technology-enabled circular economy for sustainable production and consumption
- The role of digitalisation (e.g. Industry 4.0, Internet of Things, Blockchain, etc.) in the circular economy.

Submission Instruction

We invite submission of original research articles, reviews and perspectives on these and other related topics. The deadline for submission of full papers is **30 July 2022**. All accepted papers will be published as soon as they are accepted.

All manuscripts should be submitted at https://www.editorialmanager.com/spc/default.aspx.

Please select 'VSI: Circular Economy 2021' as the article type during the submission process. For more information about the journal and guidelines for authors please see https://www.journals.elsevier.com/sustainable-production-and-consumption.

For any queries related to the special issue, please contact Catherine Cliffe at ccliffe@icheme.org.

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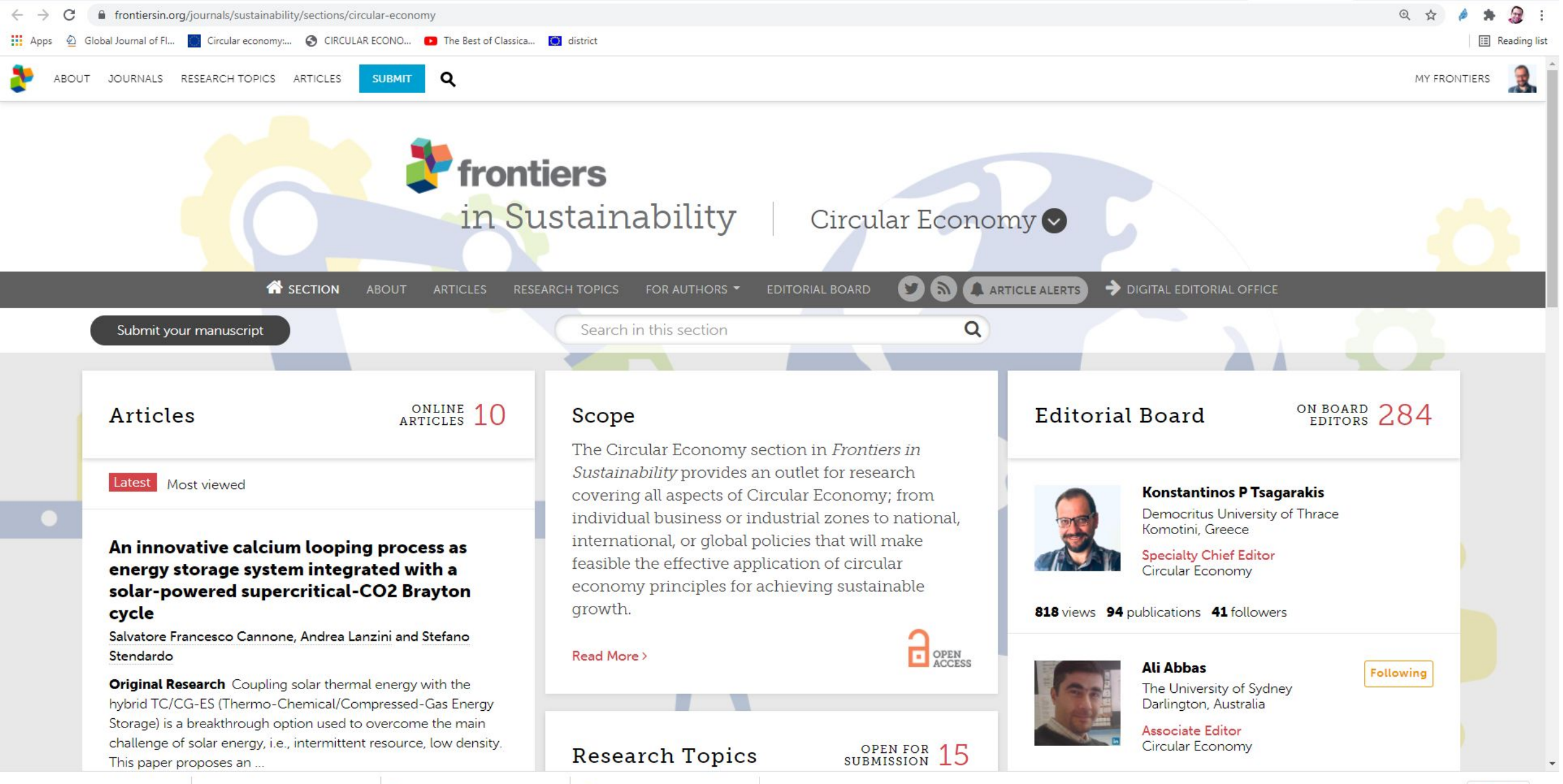
Evangelos Grigoroudis, Technical University of Crete, Greece



Circular economy Section in Frontiers in Sustainability Journal

https://www.frontiersin.org/journals/sustainability/sections/circular-economy

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Rethinking Economic Theory and Practice for a Sustainable Circular Economy

Topic Editors
Anne P.M. Velenturf, Patrick Schröder, Simon Mair and Dalia D'Amato

Circular economy has a tremendous potential to contribute to sustainable development by altering the needs of the present, to avoid the compromising of the ability of future generations to meet

Measuring the Circular Economy - Assessment Frameworks, Methods and Metrics

Topic Editors
Teresa Domenech, Michal Miedzinski and Asel Doranova

The concept of the Circular Economy (CE) has attracted attention from both policy makers and industrial stakeholders as a systemic approach to address the challenges around use of resources, decarbonisation and preservation of

Novel Insights into the Green Deal and its Strategies for Circular Economy

Topic Editors
Marzena Smol, Maris Klavins and Jolita Kruopienė

Green Deal Strategies (GDS) in recent years have acquired a completely new meaning, apart from economic and social aspects, they have also started to concern environmental aspects of human activity. Currently GDS address

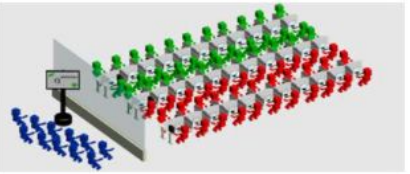
Innovations in Product and Process Design for Circular Economy Promotion

Topic Editors
Yogendra Shastri, Andrew Hoadley and Nishanth Gopalakrishnan Chemmangattuvalappil

Achieving sustainable development goals within planetary boundaries is a complex, multi-dimensional and evolving problem. Circular economy (CE) is a promising approach to achieve sustainable development, focusing on conservation of product and

Behavioral Economics for Sustainability and Circular Economy

Topic Editors
Ioannis Kostakis, Josep-Maria Arauzo-Carod and Nikolaos Georgantzis



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15 Research Topics open for submissions

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Open Research Topics

- Rethinking Economic Theory and Practice for a Sustainable Circular Economy
- Measuring the Circular Economy - Assessment Frameworks, Methods and Metrics
- Novel Insights into the Green Deal and its Strategies for Circular Economy
- Innovations in Product and Process Design for Circular Economy Promotion
- Behavioral Economics for Sustainability and Circular Economy
- Rethinking Food Systems: Circular Economy and Urban Agriculture
- Constructing Circular Economy: Transitions Towards a More Sustainable Construction Industry
- Circular Supply Chain Management
- Circular Business Models and Strategies - The Key to Sustainable Business and Innovative Supply Chains
- The Transformation Towards Circularity – Putting Ideas into Practice
- Circular Carbon Systems and Processes
- What Is A Waste? A Potential Resource to Favor a Sustainable Transition. Evidence From the Practice.
- Smart Circular Economy
- Society and Education for Circular Economy and Sustainability
- Business Models for a Circular Bioeconomy

Interested in guest editing a Research Topic?

Get in touch with me

Data Management Expert Guide

CESSDA Roadshow

October 28th 2021

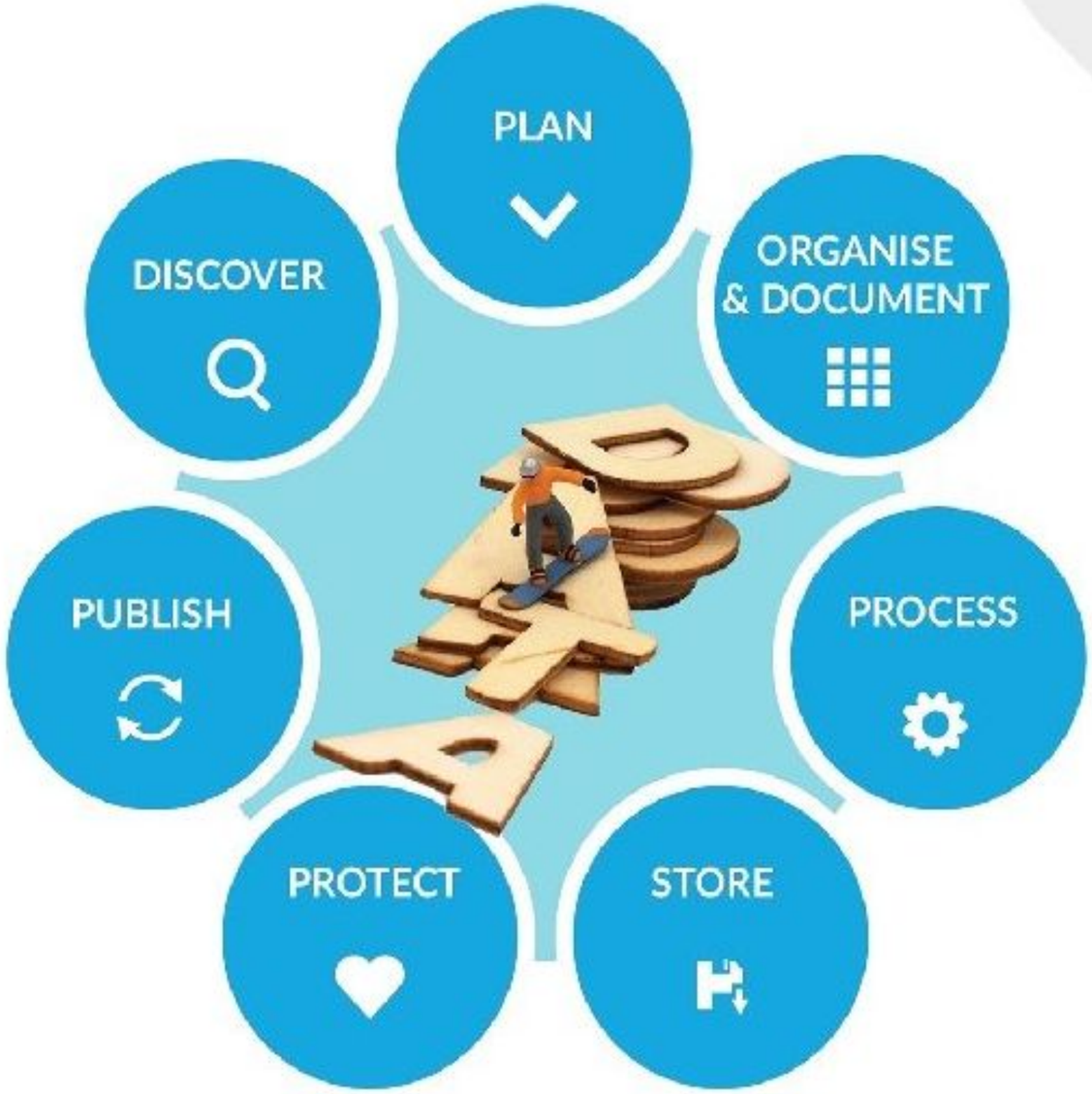
Johana Chylíková, Ph.D.
Czech Social Science Data Archive (CSDA)

cessda.eu

@CESSDA_Data

Data Management Expert Guide

Data Life Cycle



Data Life Cycle

Data Management Plan

- Data management plan (DMP)

  = a formal document that provides a framework for how to handle the data material during and after the research project.

- The DMP questions at the end of each DMEG chapter

Chapter 2. Organise & Document

cessda

Chapter 2. Organise & Document

- Covered issues:

- Folder structure, naming of files;
- Datafile structure; various types of data files; organisation of variables;
- Practical recommendations and rules for naming variables

Chapter 2. Organise & Document

- Covered issues:
- Metadata = Important
- Metadata standards & how to produce metadata?
- Data level and project level documentation
- Metadata standard DDI
- Resources for further reading

Chapter 3. Process

Processing of data

Operations needed to prepare your data files for analysis and data sharing

3. Process

- Covered issues:
- Errors in data entry
- Transcription of qualitative data
- Protection of respondents, privacy; anonymization
- Coding (survey data; qualitative data)
- Recommendations and examples
- Survey weights
- Long term preservation of data

Thank you for your attention

https://www.cessda.eu/dmeg

Johana.Chylikova@soc.cas.cz

Czech Social Science Data Archive (CSDA)

Archiv.soc.cas.cz

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@CESSDA_Data

InnoRenew CoE

Livade 6, 6310 Izola/Isola, Slovenia, T: +386 40 282 944, E: coe@innorenew.eu, www.innorenew.eu

Challenges with the reuse of data on circular economy: Experience of researchers at the InnoRenew CoE

Dr. Ana Slavec

ana.slavec@innorenew.eu

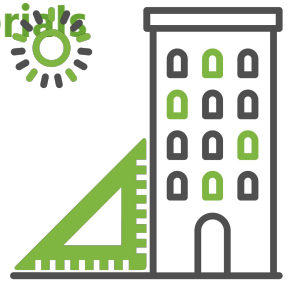
About InnoRenew CoE

Human Health in the Built Environment

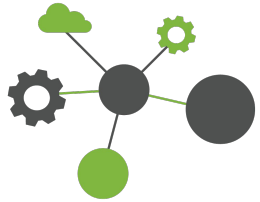
Wood modification

Renewable Materials Composites

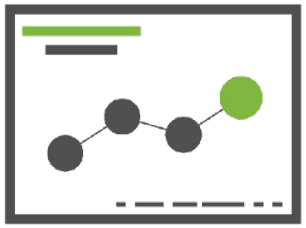
Sustainabile Building with Renewable Materials



ICT in Renewable Materials and Sustainable Building



Experimental Design and Data Analysis



Projects related to circular economy (1/3)

Revitalisation of traditional industry: An open innovation framework for Slovenia‘s furniture sector

Innovation activities of Austrian and Slovenian companies in the wood-value chain

Projects related to circular economy (2/3)

Optimisation for sustainable supply chains

Optimisation problems of the residual biomass value chain

Reverse logistic network of residual wood biomass

Projects related to circular economy (3/3)

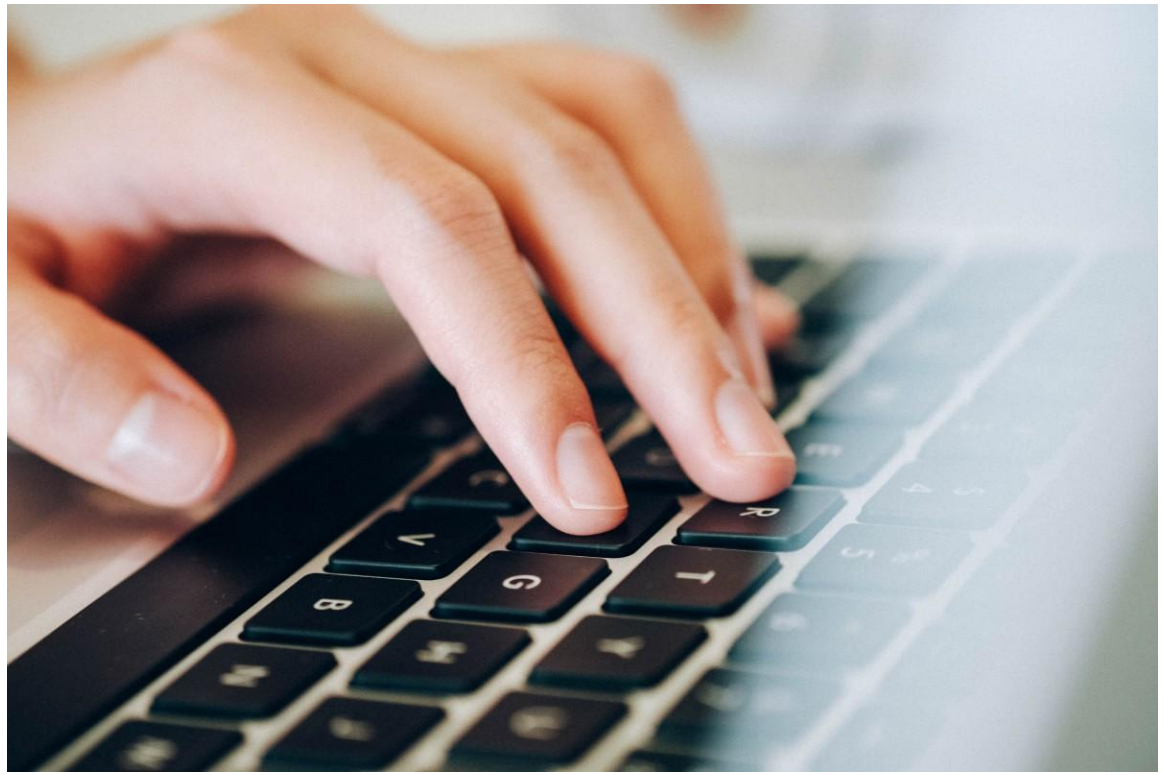
Underpinning the vital role of the forest-based sector in the Circular Bio-Economy (WoodCircus)

Wood and wood products over a lifetime (WOOLF)

WOOLF

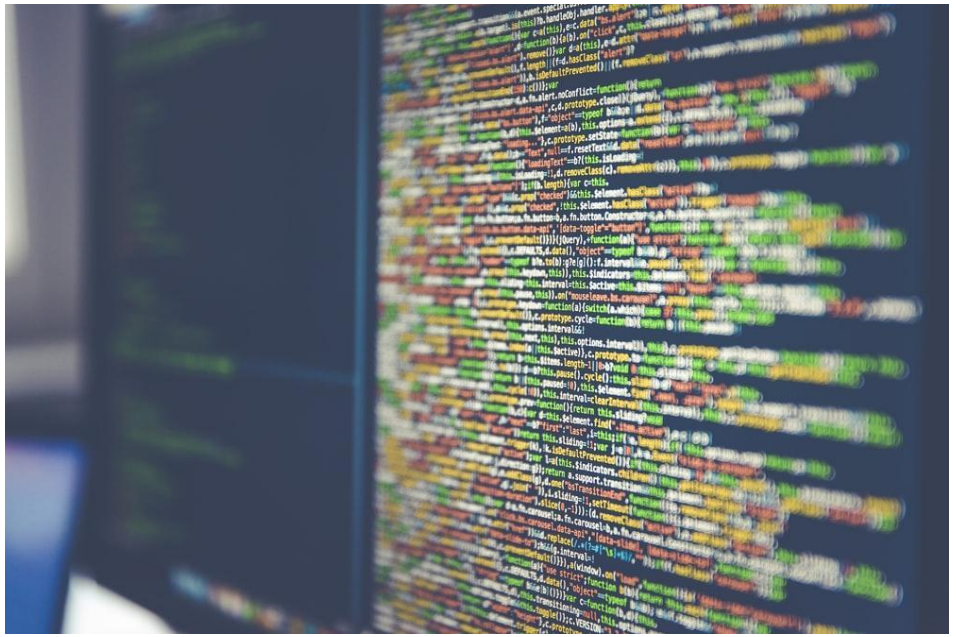
Secondary data sources

- Statistical office(s) and Eurostat
  - Community innovation survey
- Slovenian Forestry Institute
- Data collected directly from enterprises (e.g. waste management data, electrical consumption, water use, salary ranges, materials used)



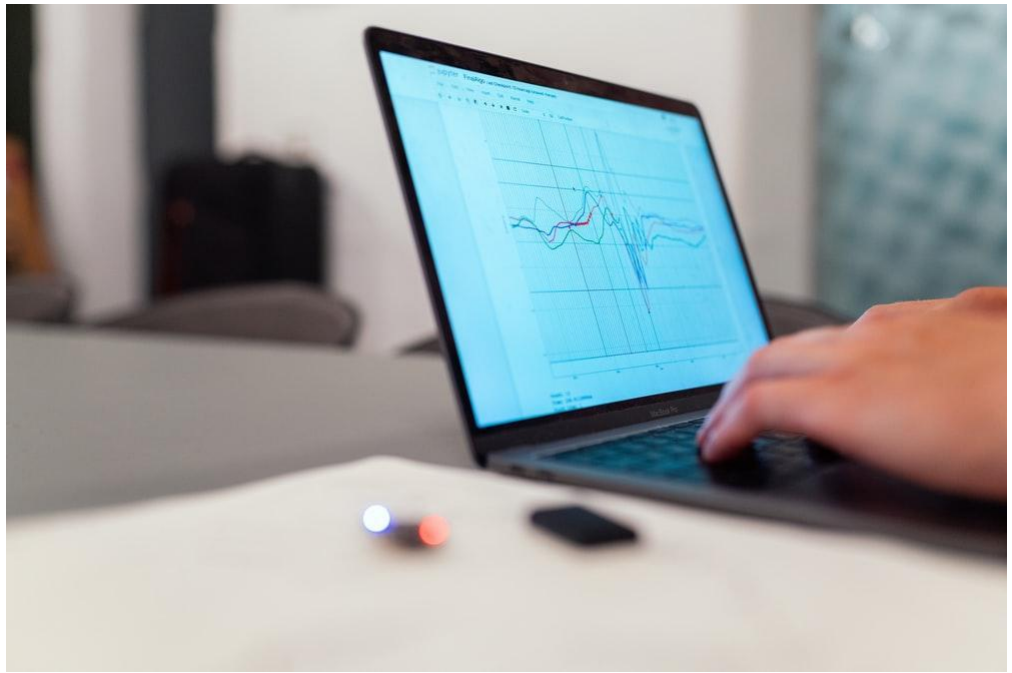
Issue 1: No data available for certain domains and topics

- No data for certain categories of units (e.g. micro-enterprises, farms)
- No network data between different actors in the system available so we have to rely on simulations instead of actual data
- No data for specific topics (e.g. attitudes towards products made from used wood)
- Timeliness issues (data available only up to a certain year, long wait for most recent data)



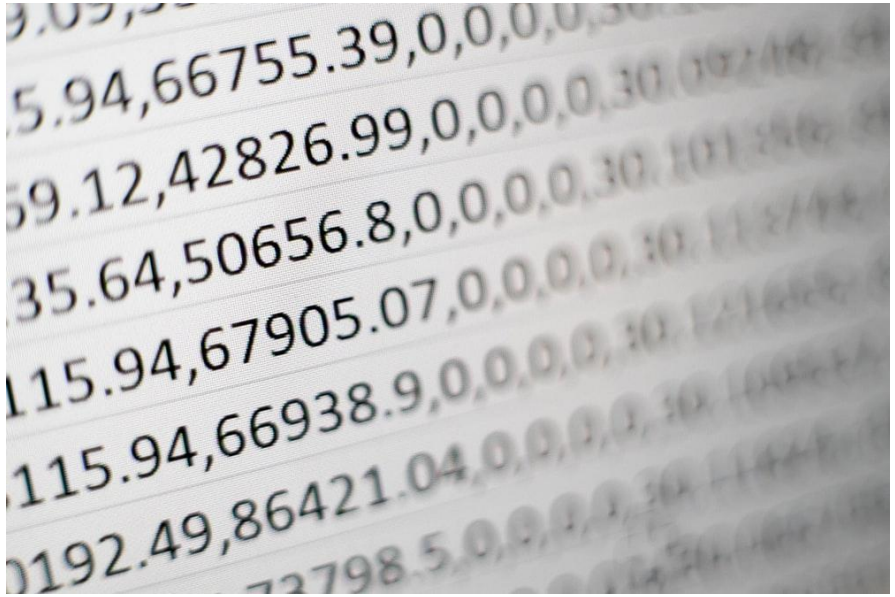
Issue 2: Only aggregate data available, no microdata

- Some data available only on yearly level so it is not possible to analyse seasonality patterns
- Only total sum data available, without specific subcategories (e.g. no facilty types for waste data processing data)
- Interoperability issues



Issue 3: Data available only under strict protection measures

- Company data usually under strict non-disclosure agreements
- Inconveniences with the use of official data
  - Eurostat microdata can be accessed only through desktop computers, no laptops allowed
  - Statistical offices offer possibility to use safe rooms but the amount and frequency of data exports is limited (e.g. exports of values below a certain threshold is not allowed)
  - VPN option required rental of equipment
- Reproducibility issues



InnoRenew CoE

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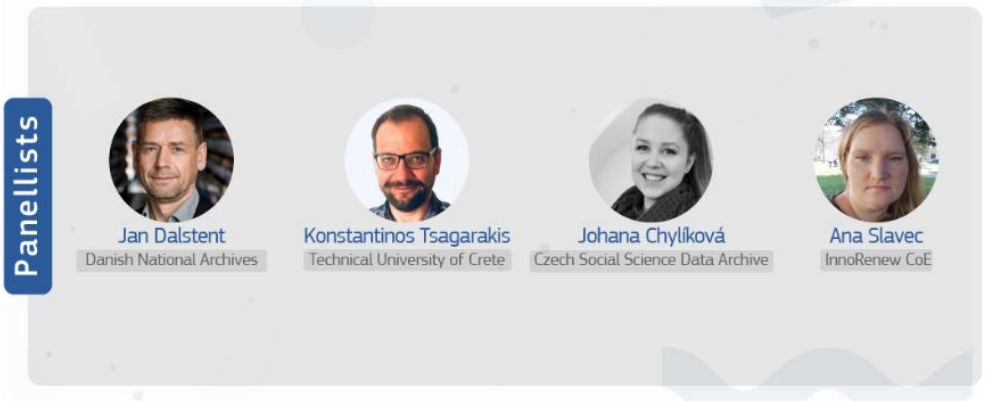
Thank you for your attention.

CESSDA Roadshow on Circular Economy

1. What does the circular economy look like in the social sciences? What data do we contribute?
2. How can CESSDA help (is already helping) to make official statistics more user friendly?
3. Based on the presentations earlier how would you describe the societal impacts of research data used for circular economy studies?
4. How do we break down barriers on re-using statistical data for cross disciplinary research on circular economy ?
5. How important is the support from service providers/data experts for your research workflow?



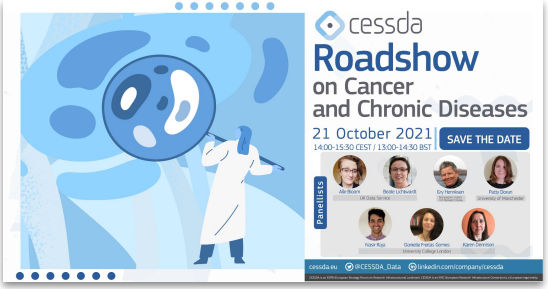
CESSDA Roadshow in numbers

5 global challenges addressed

31 speakers

200+ people registered

15 user stories showcased



Thank you for your attention!

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