Circular economy business models: Value chains, challenges and EU policies

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Structure of the presentation

1. Framework of circular economy processes
2. Circular economy approaches in different value chains
3. Barriers to implementing circular economy business models
4. EU policy landscape: Achievements, challenges and the way forward

- Independent European think tank based in Brussels, founded in 1983
- Objectives:
  - Policy-oriented research
  - Forum for discussion
- Strong in-house research capacity and an extensive network of partner institutes throughout the world
- Extensive portfolio of work in the circular economy field:
  - CIRC4Life: Circular economy business models in the electronics and food value chains
  - CICERONE: Platform for circular economy funding and programming in the EU
  - CEPS is a Knowledge Partner of the Green Growth Knowledge Platform

Framework of circular economy processes

USE LESS PRIMARY RESOURCES

- Recycling
- Efficient use of resources
- Utilisation of renewable energy sources

MAINTAIN THE HIGHEST VALUE OF MATERIALS AND PRODUCTS

- Remanufacturing, refurbishment and re-use of products and components
- Product life extension

CHANGE UTILISATION PATTERNS

- Product as service
- Sharing models
- Shift in consumption patterns

Application of circular economy processes in different sectors

	Circular process	Examples of sectors where circular processes can be applied
USE OF LESS PRIMARY RESOURCES	Recycling	Automobile industry, Textile industry, Building sector, Packaging sector, Critical Raw materials, Forest sector, Chemical industry
	Efficient use of resources	Building sector, Plastics industry, Mining and metals industry, Food sector
	Utilisation of renewable energy sources	Chemical industry, Food industry, Forest sector, Defense industry
MAINTAIN THE HIGHEST VALUE OF MATERIALS AND PRODUCTS	Remanufacturing, refurbishment, and reuse of products and components	Automobile industry, Manufacture of consumer electronics, Building sector, Furniture sector, Transport
	Product life extension	Automobile industry, Electronics industry, Household appliances, Food industry, Textile industry, Defense industry
CHANGE UTILISATION PATTERNS	Product as service	Manufacture of consumer electronics, Household appliances, Transport, Building sector, Automobile industry
	Sharing models	Automobile industry, Transport, Accommodation, Clothing
	Shift in consumption patterns	Food sector, Publishing sector, E-commerce sector

Circular economy approaches in different value chains – Mobile phones

Photo by Paul Hanaoka on Unsplash

Mobile phone market

- Globally, the mobile phone market has boomed in the past few years, also due to the fast penetration of smartphones and rising demand in emerging markets
- From 2012 to 2015, global smartphone ownership doubled, nearing two billion by the end of 2015
- In the developed world the penetration of smartphones will further increase to more than 90%, and by 2023 already, five million devices could be sold every day

Contribution to e-waste

- E-waste represents a huge challenge globally; in 2016 the generation of e-waste reached 44.7 million metric tonnes (Mt), of which 435 kiloton (kt) were mobile phones
- Europe, including Russia, is the continent that generates the second highest amount of e-waste, with 16.6kg generated per inhabitant
- Europe also has the highest collection rate of e-waste globally (35%)
- Different routes for e-waste (based on 2012 data)
  - 35% of e-waste was collected and recycled
  - 16% was exported
  - 33% was recycled in non-compliant conditions
  - 8% was scavenged for valuable parts
  - 8% was discarded as waste
  - Situation for mobile phones is worse as only 12-15% are properly recycled

Scenarios

Phones sold in 2017

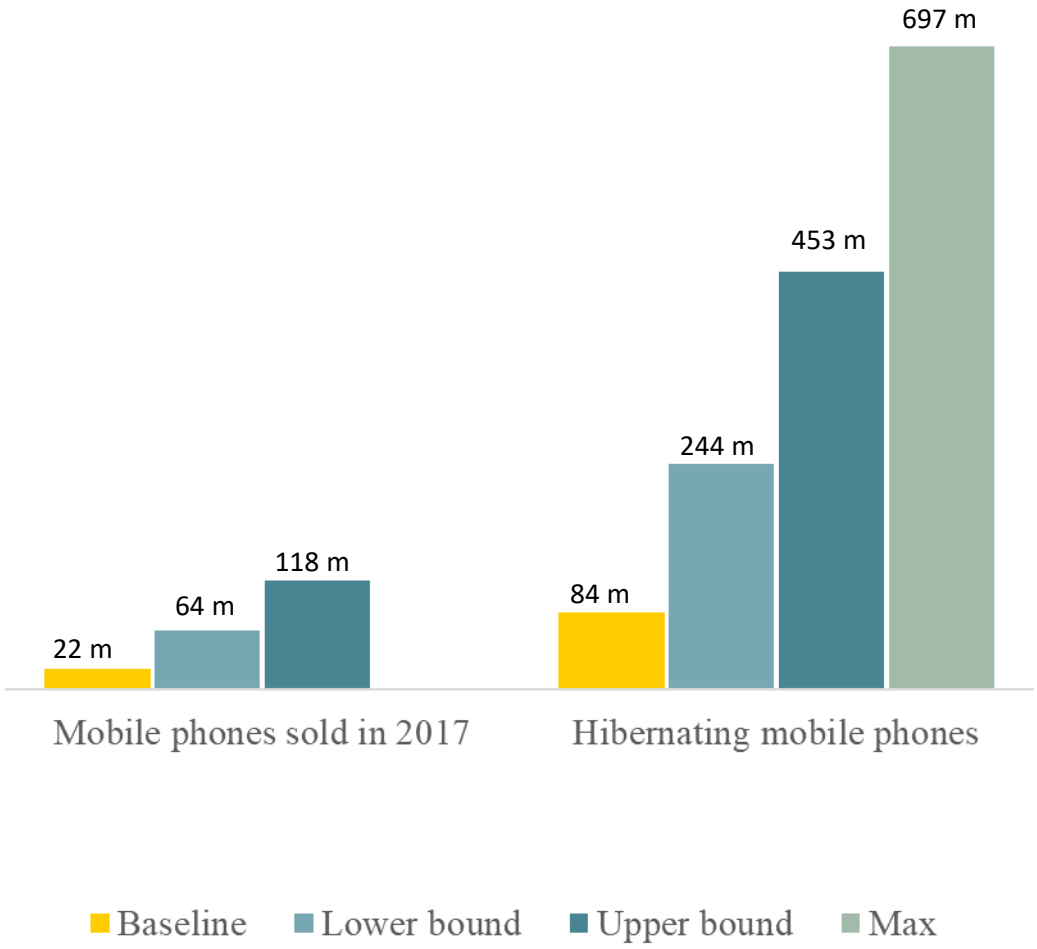
Variables	Baseline	Lower bound	Upper bound
Recycling rate	12%	35%	65%
Average lifetime	21.6 months	33.6 months	45.6 months
Rate of refurbishment	10%	20%	30%

Stock of hibernating phones

Indicator	Baseline	Lower bound	Upper bound	Max
Recycling rate	12%	35%	65%	100%

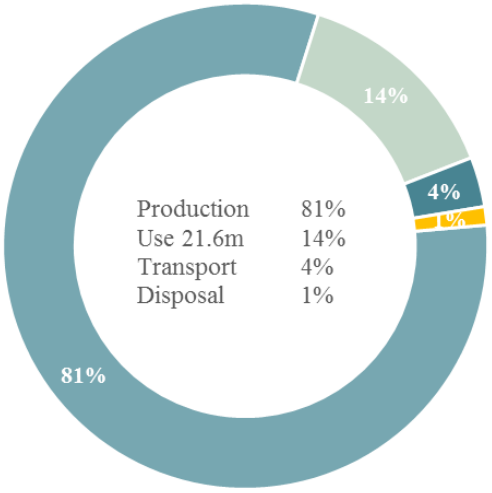
Impacts estimated through scenario analysis

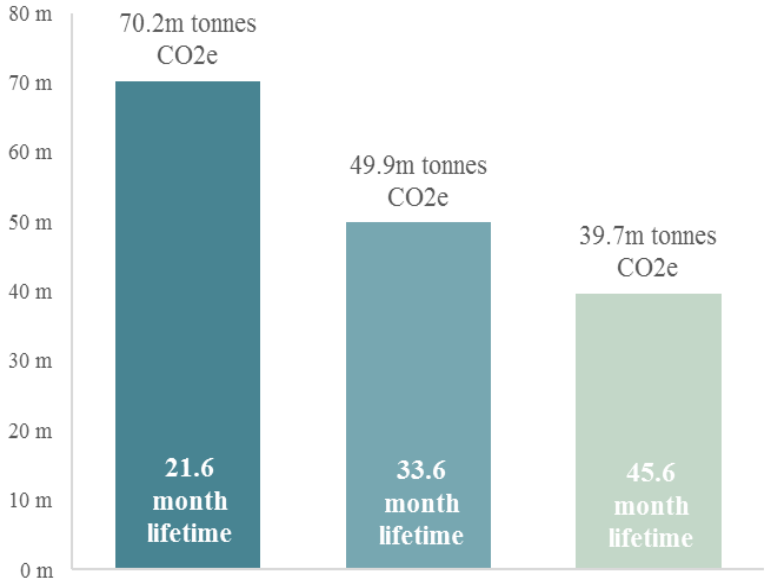
Estimated number of recycled phones in different scenarios



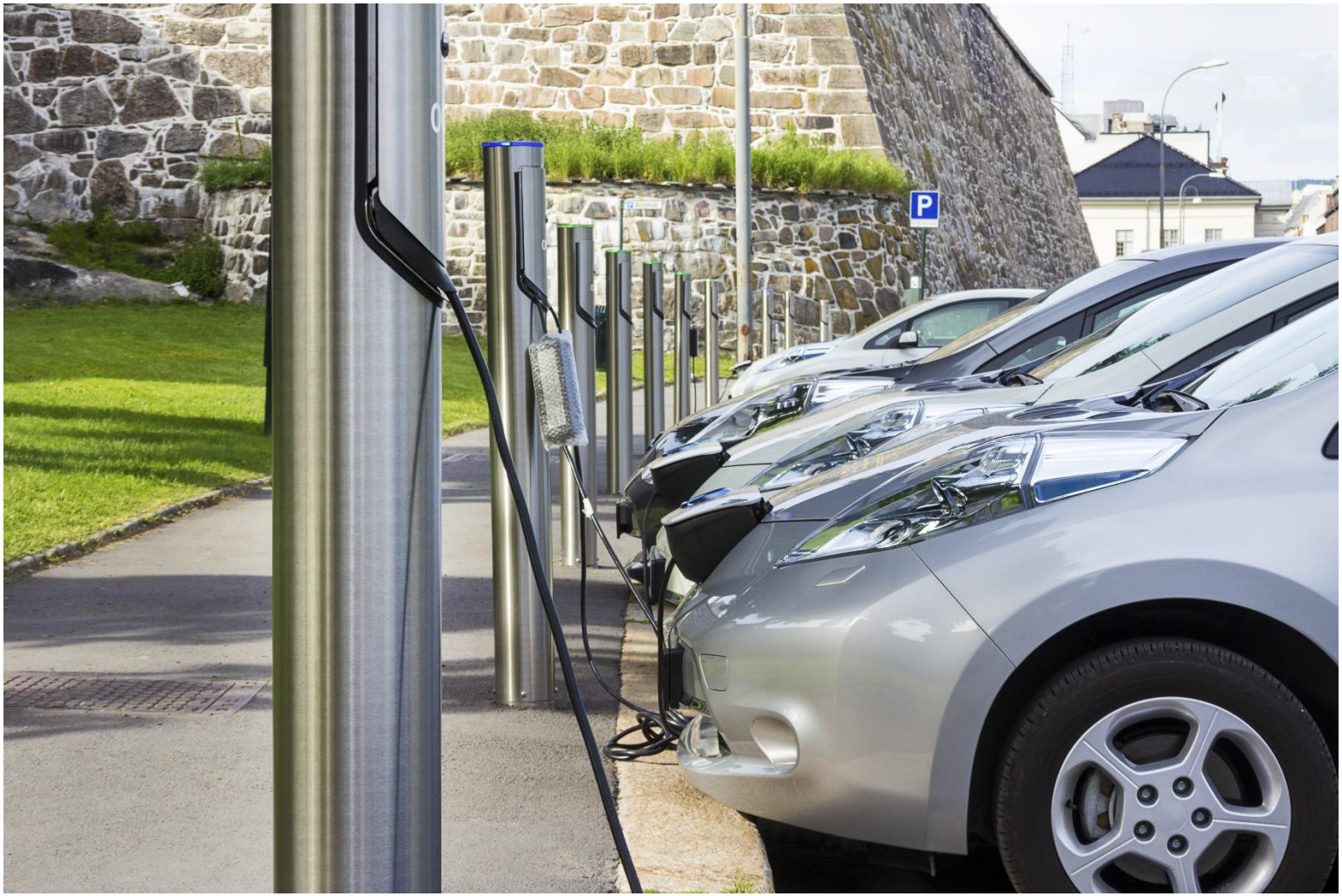
Impacts estimated through scenario analysis

Phones sold in 2017 – Scenario emissions for a 10-year period





Circular economy approaches for electric vehicle batteries



EV batteries and the circular economy

- EVs are among the key technologies for decarbonising road transport.
- Lithium-ion batteries are the most common type of batteries used in these vehicles
- A key question is: What will happen to this large number of batteries when they reach their end of life?
- Such batteries contain materials that often combine a high economic importance with a supply risk (e.g. cobalt)
- Europe is currently lacking a strong battery cell manufacturing base

Scenarios for battery recycling in Europe

Battery Recycling	Scenario 1	Scenario 2
Collection/take back rate for recycling within the EU	65%	85%
Cobalt recycling efficiency rate	94%	99%
Nickel recycling efficiency rate	95%	97%
Aluminium recycling efficiency rate	98%	98%
Lithium recycling efficiency rate	57%	94%

CEPS study on electric vehicle batteries: Reduce the EU's dependence on critical raw materials

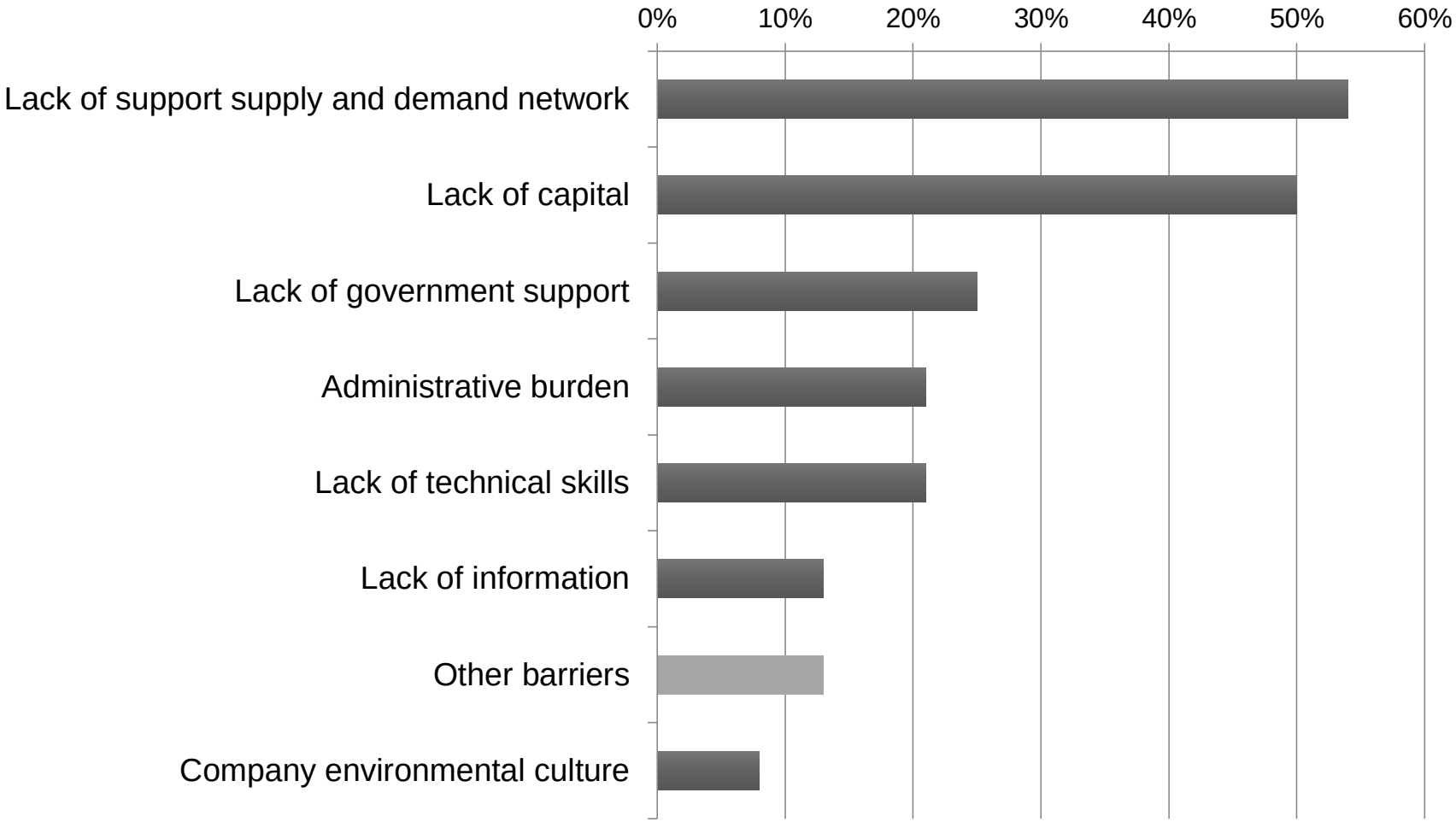
	Scenario 1	Scenario 2	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	2030		2035		2040	
Amount of recovered material (tonnes)						
Cobalt	2,922	4,058	6,519	9,054	13,509	18,763
Nickel	10,604	13,535	23,662	30,200	49,035	62,584
Aluminium	31,826	39,783	71,013	88,766	147,163	183,954
Lithium	1,162	2,421	2,593	5,401	5,373	11,193
Value of recovered material (million €)						
Cobalt	213	295	475	659	983	1,366
Nickel	123	157	274	350	569	726
Aluminium	57	71	126	158	262	328
Lithium	15	32	34	71	71	148
Total	408	555	909	1,238	1,885	2,568

In 2030 over 41% of all cobalt imports could be covered by recycling EV batteries

Net savings of CO2-eq emissions through recycling electric vehicle batteries

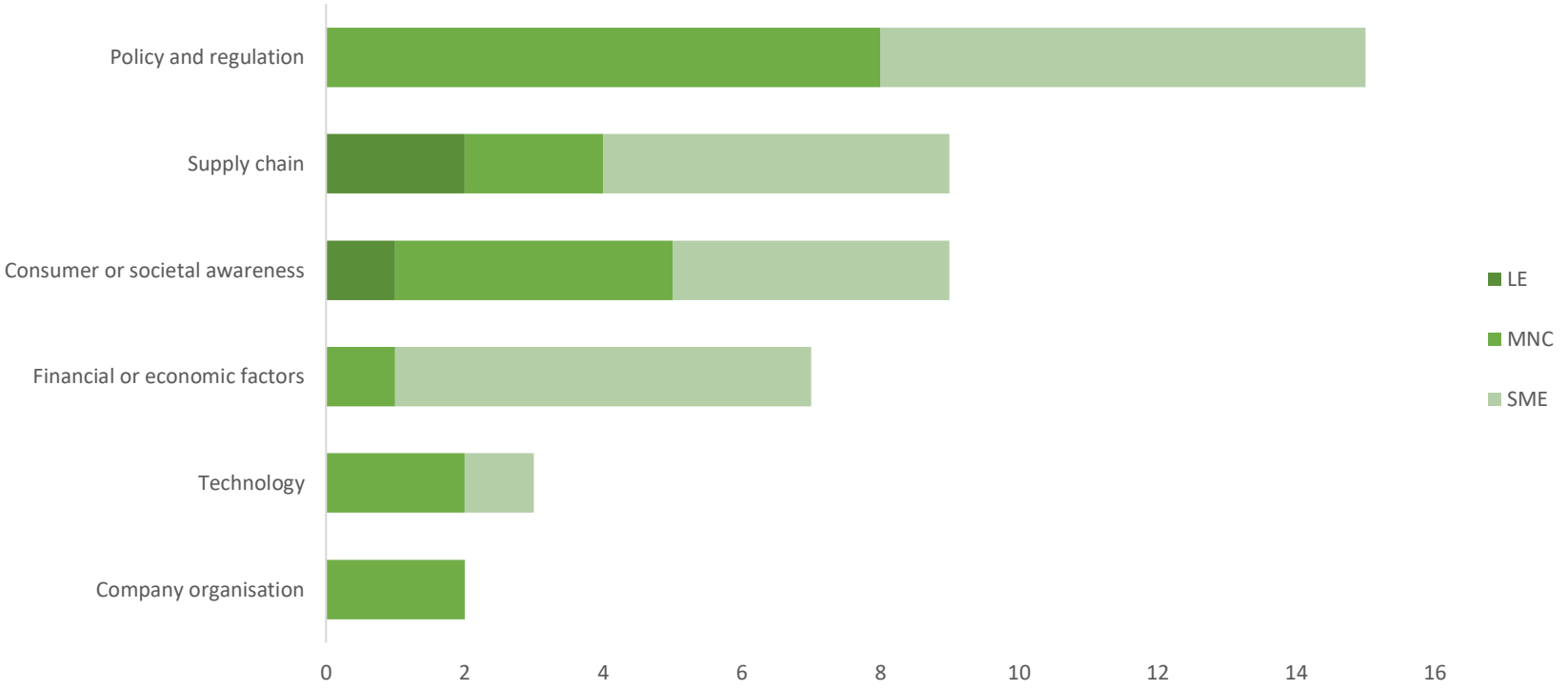
The net savings of over 1 million tonnes of CO2-eq in 2040 (Scenario 2) are comparable to the annual production of two primary aluminium smelters

Barriers to the implementation of circular economy business models



Source: Rizos et al. (2016).

Ongoing research on barriers to implementing circular business models in the electrical and electronic equipment (EEE) sector



COV-19 impacts on companies in the EEE value chain

• Impacts on operations: Collection sites closed, implementation of some new business models delayed, supply chains affected, demand has in some cases dropped

• Rethinking of circularity approaches: Strategic focus on online business, rethinking of operations, demand for some services increased, increase of teleworking, increased interest by consumers

EU policy landscape: Achievements, challenges and the way forward

What has been achieved

Policy action at the EU level between 2015-2019

- A revised legislative framework on waste
- EU Strategy for Plastics in the Circular Economy
- Progress on eco-design requirements for energy-related products
- Monitoring framework for the circular economy

→ Various member states have also adopted strategies and government-wide programmes for a circular economy

Key challenges

- The shipment of waste for materials' recovery within the EU is a complex process entailing a high administrative burden and costs
- EU legislation on hazardous substances: i) Difficulties in remanufacturing products, ii) uncertainty about substances included in products
- Low progress in setting eco-design requirements for non energy related-products
- Need for more evidence on the merits and de-merits of different circular options
- Wide differences in waste management performance across member states; a lack of waste collection and processing infrastructure is an issue in several countries

Priorities under the 2020 EU Circular Economy Action Plan

• Priority sectors: Electronics and ICT, Batteries and vehicles, Packaging, Plastics, Textiles, Construction and buildings, Food, water and nutrients

- Some key actions:
  - New product policy framework (eco-design, transparency across value chains)
  - Consumers and public buyers (‘right to repair’, green public procurement)
  - Value chain specific actions (EU-wide take back scheme to return or sell back old electronic devices, measures to improve collection and recycling of batteries, separate collection of textile waste)

- THANK YOU! -

Key research publications:
https://www.ceps.eu/ceps-publications/circular-economy-for-climate-neutrality/
https://www.ceps.eu/ceps-publications/identifying-the-impact-of-the-circular-economy-on-the-fast-moving-consumer-goods-industry/
https://www.ceps.eu/publications/prospects-end-life-electric-vehicle-batteries-circular-economy
https://www.ceps.eu/publications/role-business-circular-economy-markets-processes-and-enabling-policies

Full list of CEPS publications and events on resources & circular economy:
https://www.ceps.eu/ceps-topic/circular-economy-climate-and-the-environment/