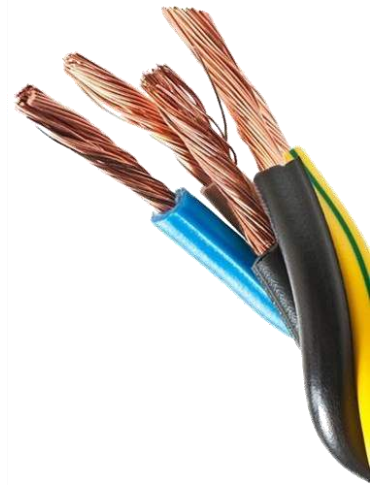




COST BENEFIT ANALYSIS ON PVC CABLES RECYCLING

Alessandro Marangoni

PVC4cables conference, October 5th, 2022



1. The PVC recycling and the current context
2. Cost-Benefit Analysis methodology
3. The scope of the study
4. The main results
5. Conclusions



1. The PVC recycling benefits



- The adoption of PVC in several applications has been growing in the last years, along with the perception of its advantages compared to other materials
- The consumption of PVC in the last decade has increased due to many reasons: technical performance, competitive price, flexibility in application, possibility to be recycled, etc.
- The European PVC industry has been working hard since the late 90's to address the challenges of sustainable development. Significant progress has been achieved in waste management, innovative recycling technologies and responsible use of additives.
- Sustainability has become a key issue and an evaluation of the cost-benefits of PVC cables recycling has been done on 2019-20, showing significant net benefits.



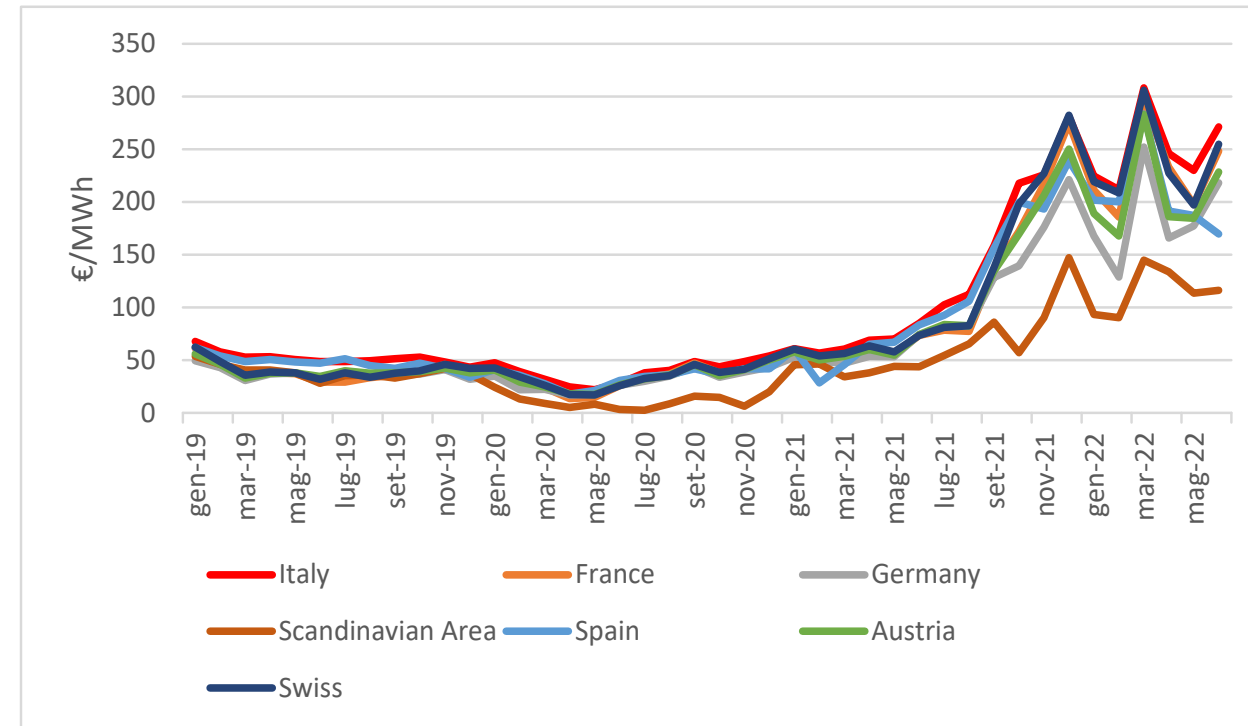
The objective of the study is to provide a Cost-Benefit Analysis of recycling PVC cables

- A first study was done in 2019 showing the net benefits of PVC cables recycling
- The dramatic changes in the financial and geopolitical scenario makes necessary checking the results of the analysis in the new market framework.
- The price increases of raw materials, components and manufacturing processes which occurred between the second half of 2021 and 2022, affect all the manufacturing industries in Europe

The sharp price growth has been triggered mainly by the amazing rise in energy prices



Power prices in Europe



Source: elaboration on various sources

2. Cost-Benefit Analysis methodology

- The methodology used for the study is the Cost-Benefit Analysis (CBA).
- This approach allows to examine the direct and indirect impacts of a project (investment, technology, plant, etc.) for the community (or a country) as a whole.
- The CBA aims to verify that costs incurred by a project are lower than its benefits.
- The analysis compares of different scenarios of carrying on (or not) a project.
- CBA has been developed according to the best practices described in the literature and OECD guidelines.



Cost-Benefit Analysis methodology



- For the purpose of this study, the CBA considers the direct and indirect impacts of PVC pipes recycling.
- Both economic as well as environmental aspects are considered.

Economic aspects

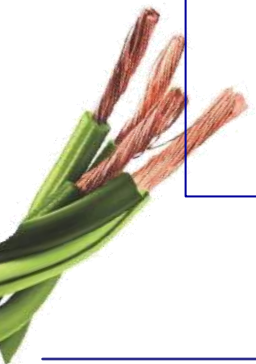
- Costs (or missed benefits)
- Benefits (or avoided costs)

of the PVC pipes recycling

Environmental aspects

- Monetary evaluation of environmental costs (or missed benefits)
- Benefits (or avoided costs)

of the PVC pipes recycling



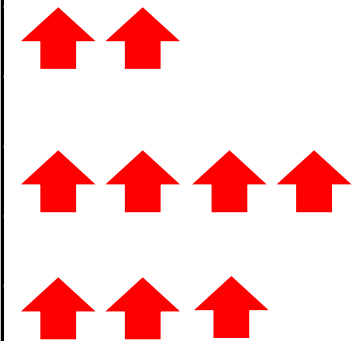
Cost-Benefit Analysis methodology



The items of the balance and its trends

COMPARISON 2022 vs. 2020 analysis (2019 data)

ITALY	2022	2020
Landfill disposal (€/ton)	230	200
Separate collection and sorting (€/ton)	280	250
Recycling (€/ton)	55	45
Other treatments (€/ton)	18	15
Incineration (€/ton)	250	220
Recovered PVC (€/ton)	650/600	500/400
EUAs (€/tonCO2)	77	30
Electricity price (€/MWh)	450	50
Gas price (€/MWh)	170	20
Recovered copper (€/ton)	6000	3700



3. The study scope

- Geographical scope: Germany, Italy and France
- Products: electricity cable FS 18 OR 18, data cable UPT 5 E
- Functional unit: 100 meters long cable is assumed as functional unit, the same adopted in the previous report. The items expressed in different unit of measure have been parametrized accordingly to the functional unit.
- Two different scenarios are considered:
 - a) recycling vs. incineration (Germany and Italy)
 - b) recycling vs. landfill (Italy)



Main results: electricity cable FS 18 OR 18

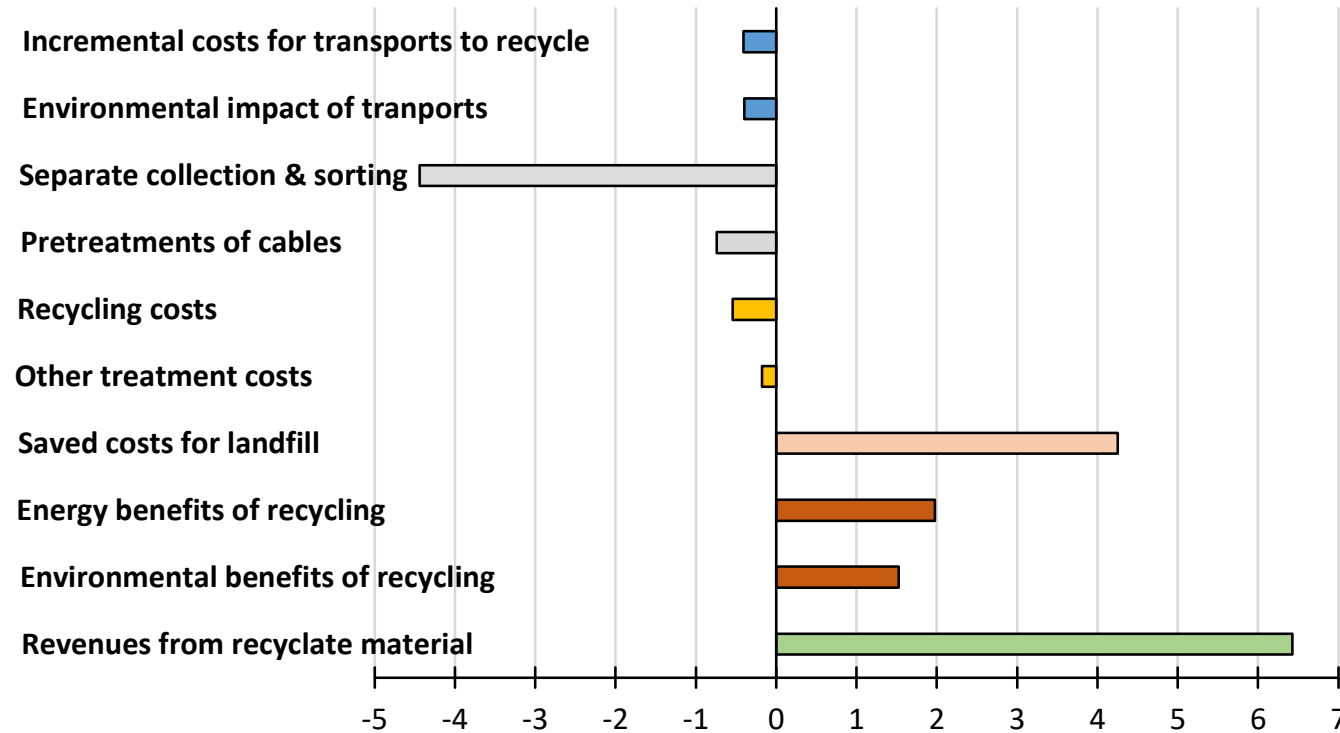


Recycling vs. Landfill without copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022



Net balance of recycling 2020



€/100 m cable

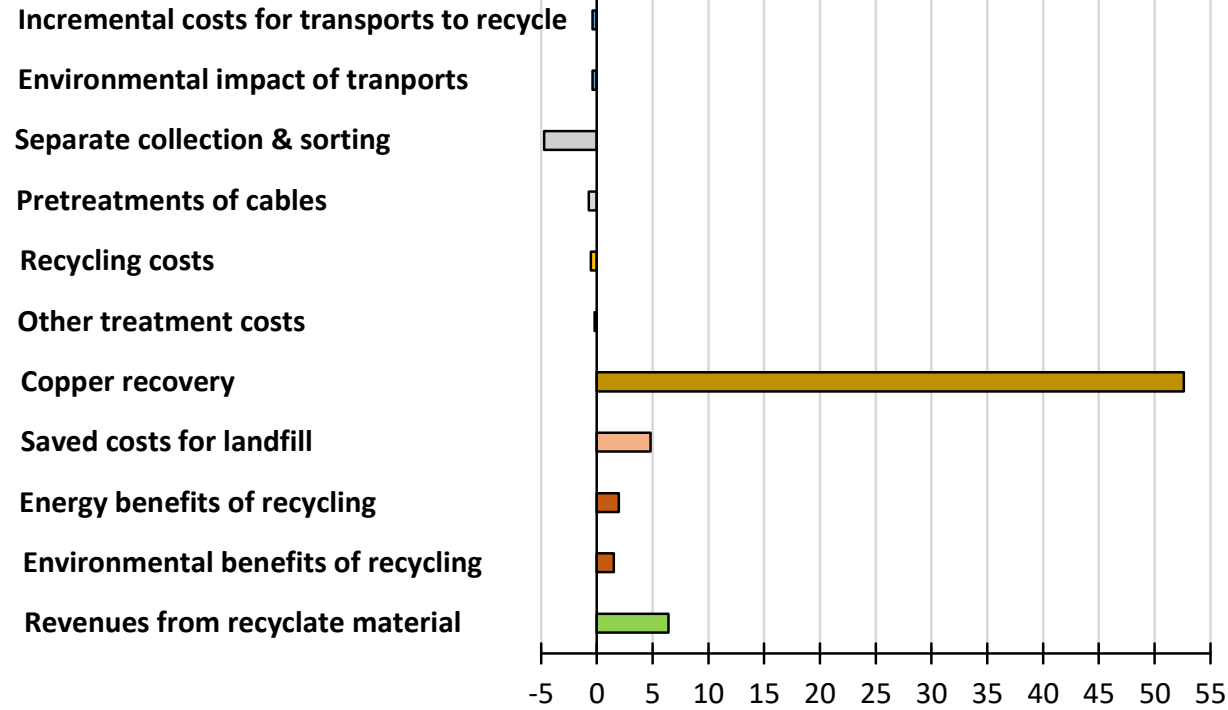
Main results: electricity cable FS 18 OR 18

COSTS

BENEFITS



Recycling vs. Landfill with copper recovery monetization



Net balance of recycling 2022 59,64

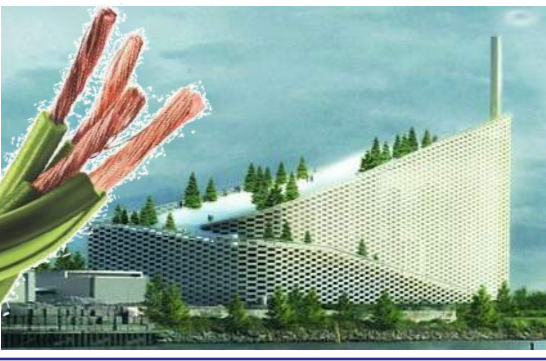
Net balance of recycling 2020 36,49

€/100 m cable

Main results: electricity cable FS 18 OR 18

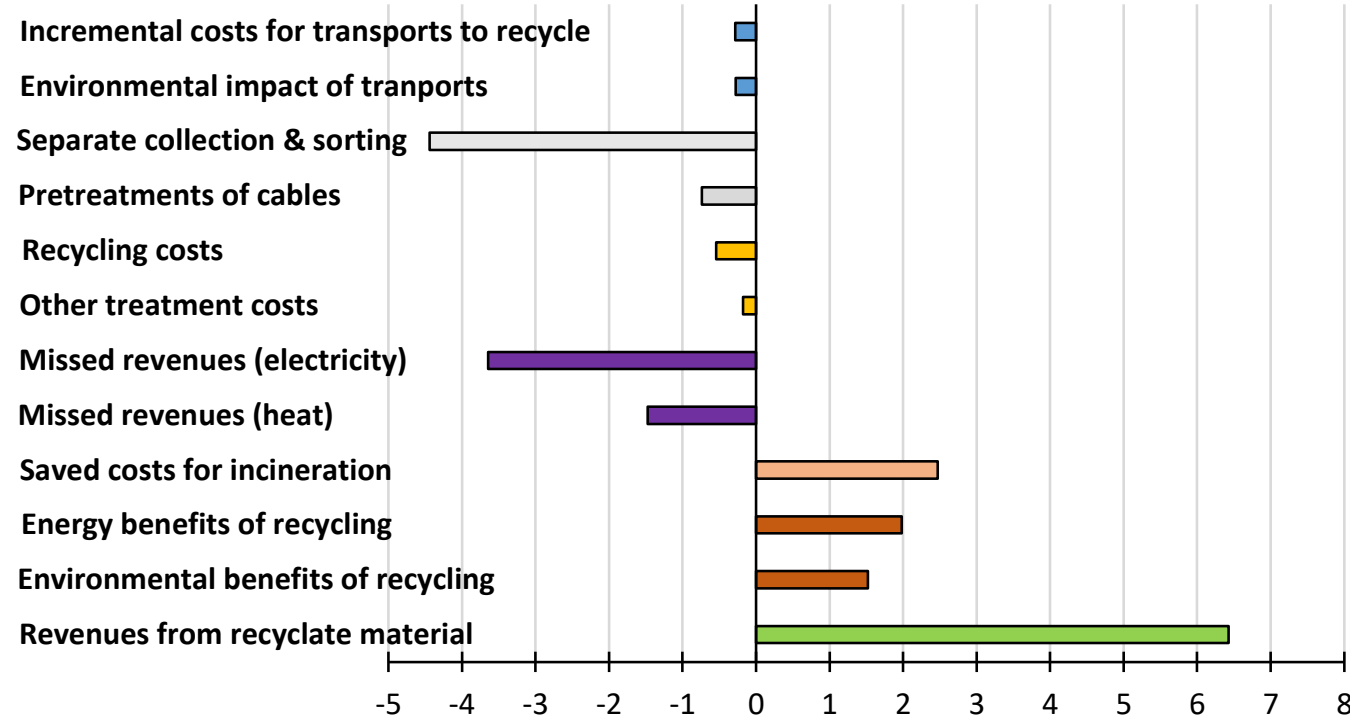


Recycling vs. Incineration without copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022 0,82

Net balance of recycling 2020 2,36

€/100 m cable

Main results: electricity cable FS 18 OR 18

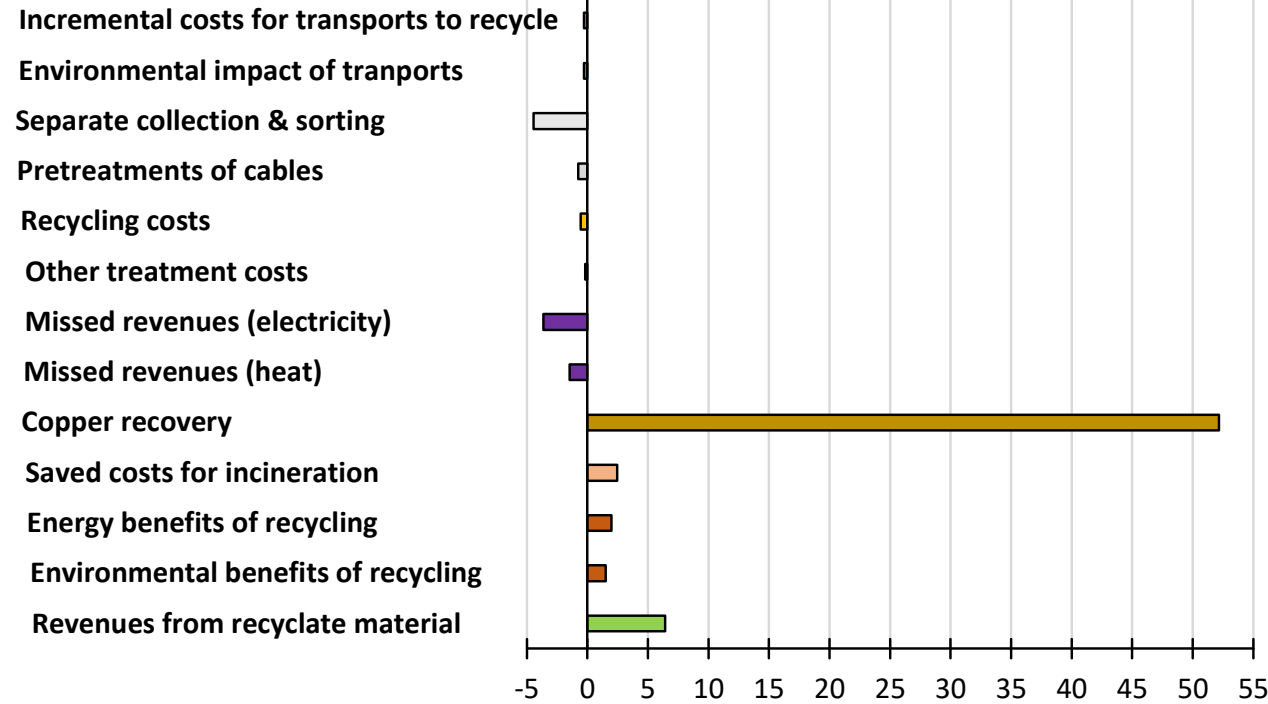
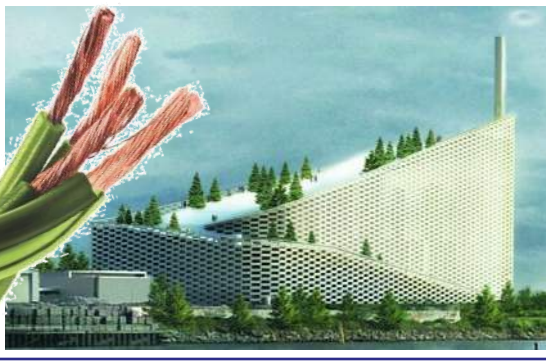


COSTS

BENEFITS



Recycling vs. Incineration with copper recovery monetization



Net balance of recycling 2022 52,98

Net balance of recycling 2020 34,52

€/100 m cable

Main results: data cable UPT 5 E PVC

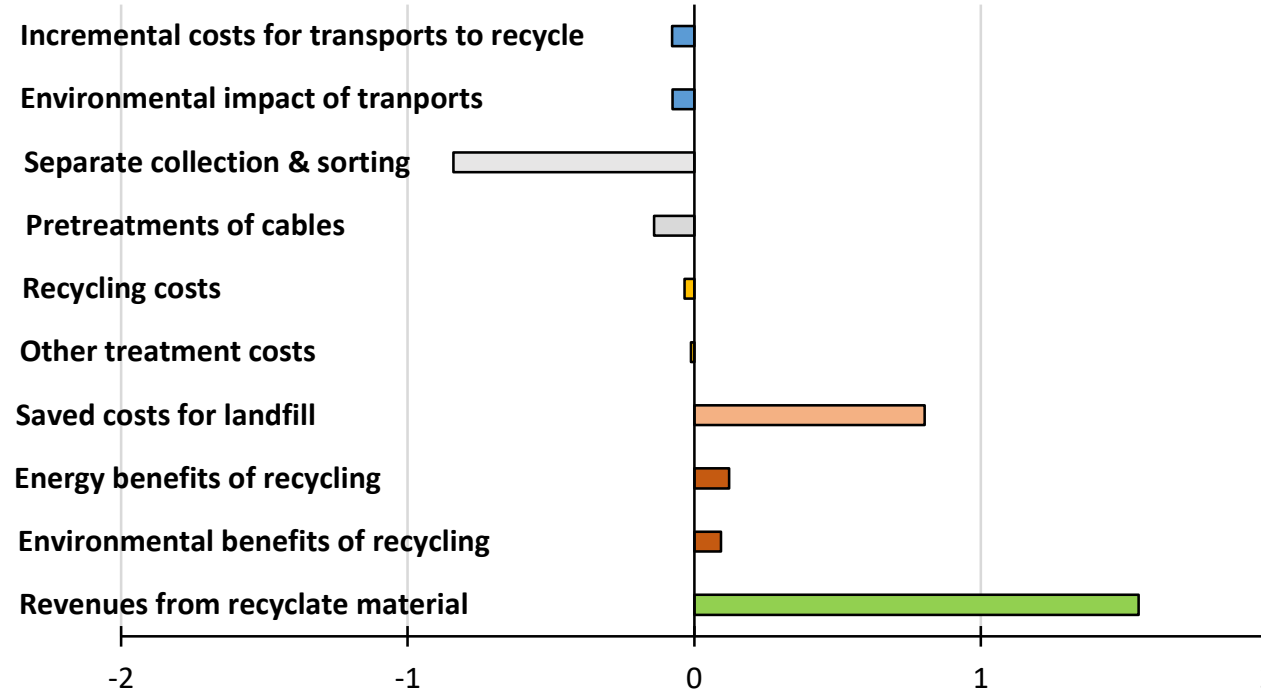


Recycling vs. Landfill without copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022 **1,40**

Net balance of recycling 2020 **0,82**

€/100 m cable

Main results: data cable UPT 5 E PVC

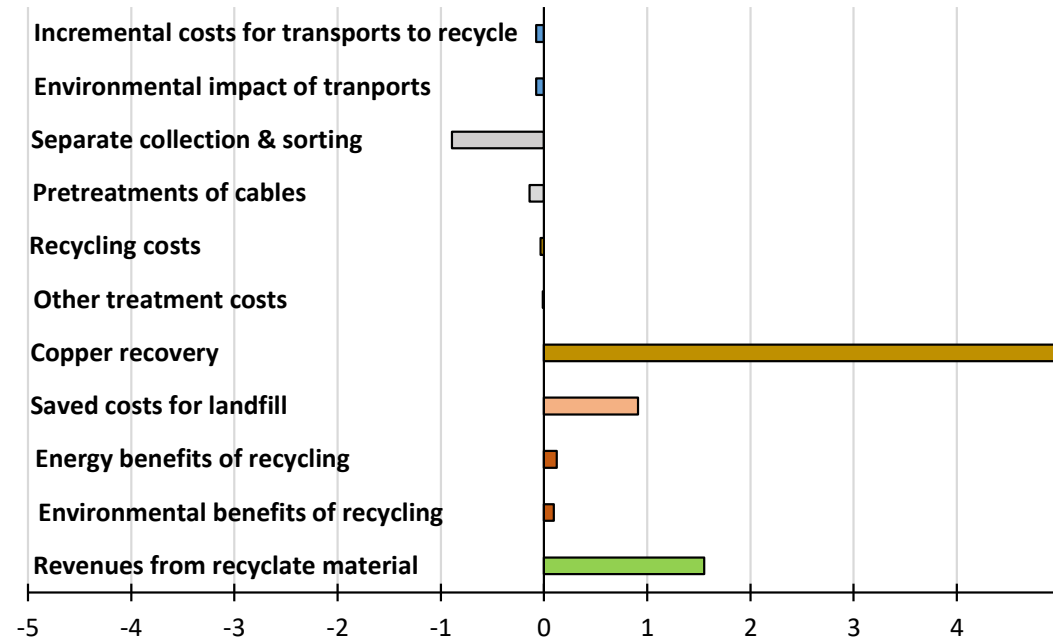


Recycling vs. Landfill with copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022



6,61

Net balance of recycling 2020



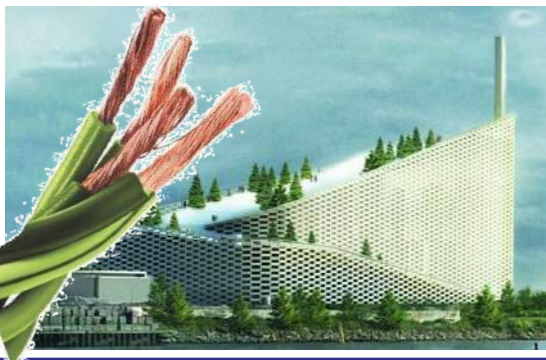
4,04

€/100 m cable

Main results: data cable UPT 5 E PVC

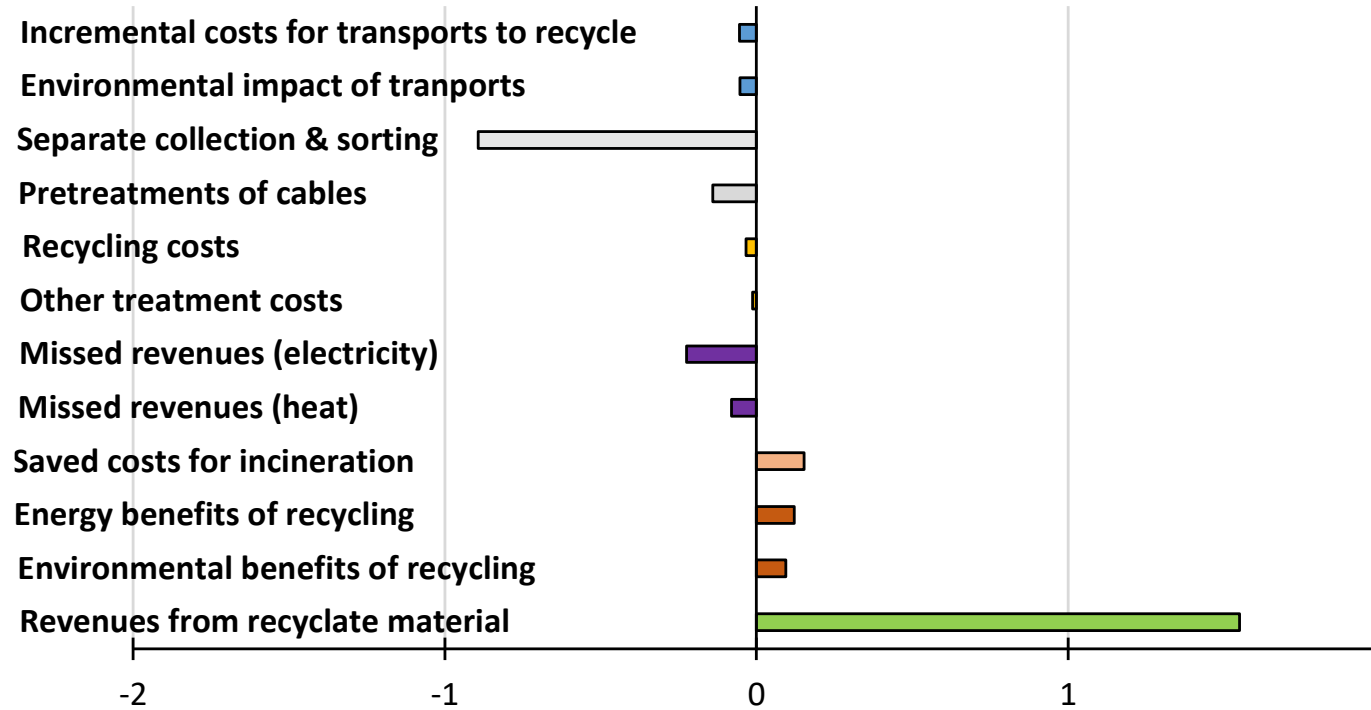


Recycling vs. Incineration without copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022 0,47

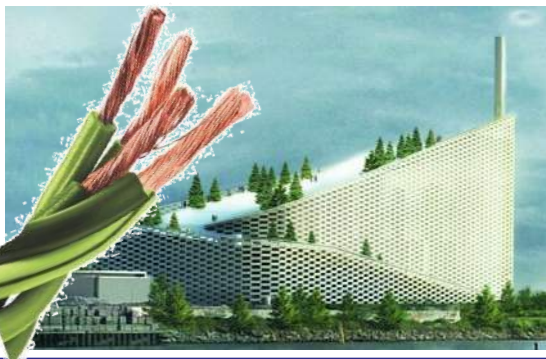
Net balance of recycling 2020 0,25

€/100 m cable

Main results: data cable UPT 5 E PVC

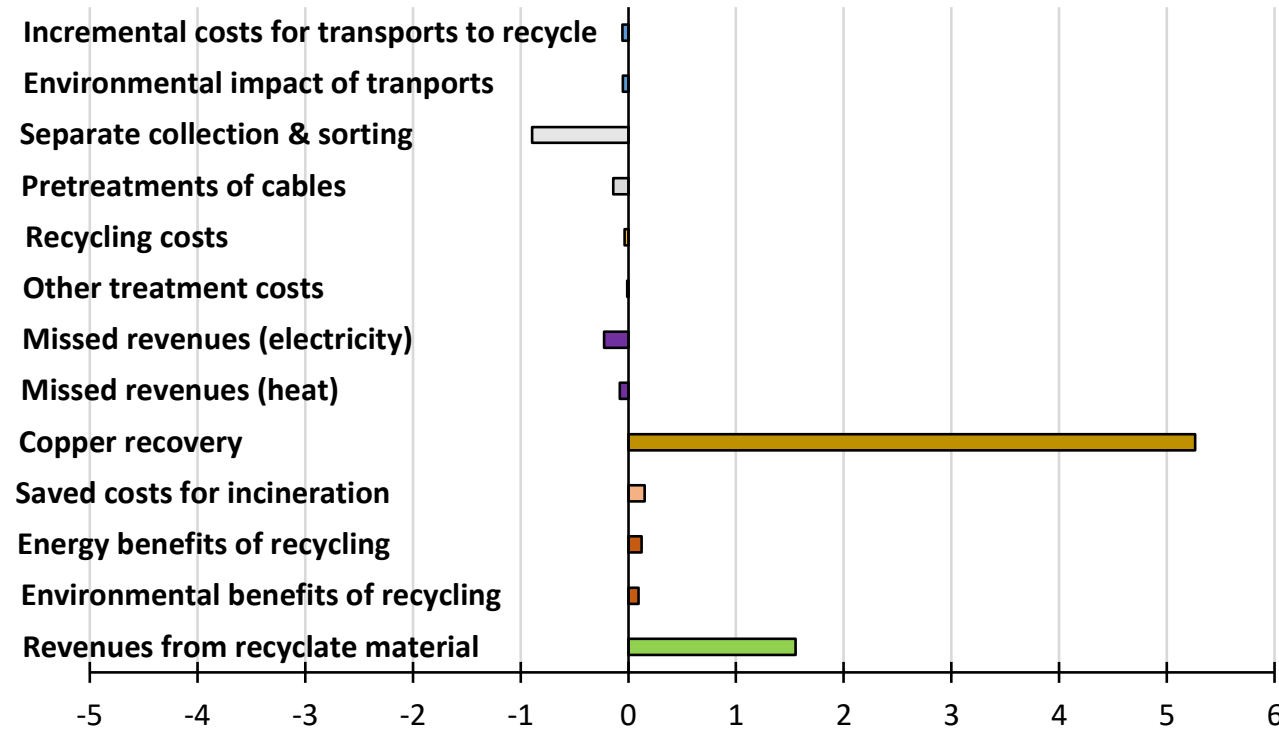


Recycling vs. Incineration with copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022 5,69

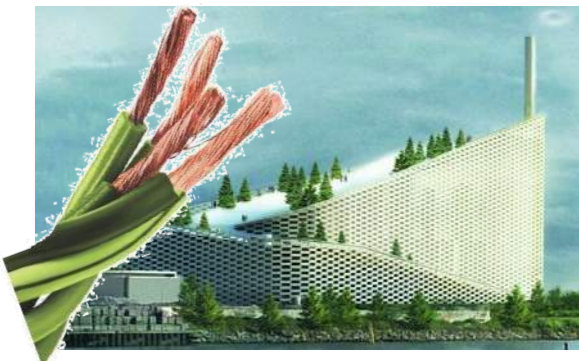
Net balance of recycling 2020 3,46

€/100 m cable

Main results: electricity cable FS 18 OR 18

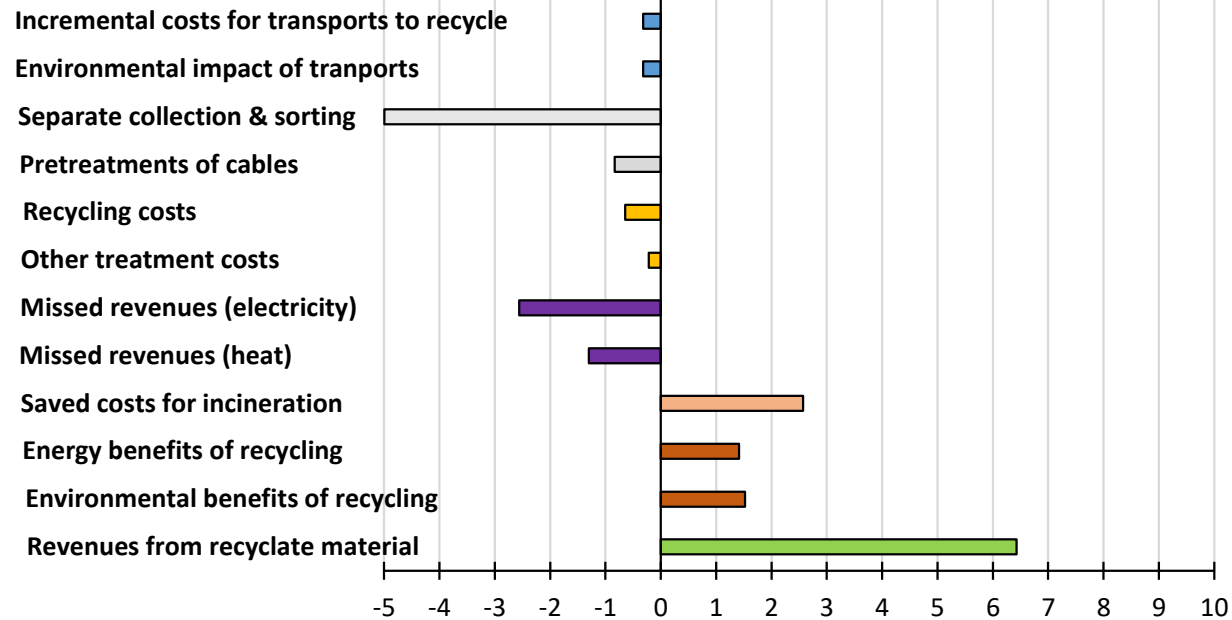


Recycling vs. Incineration without copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022 0,71

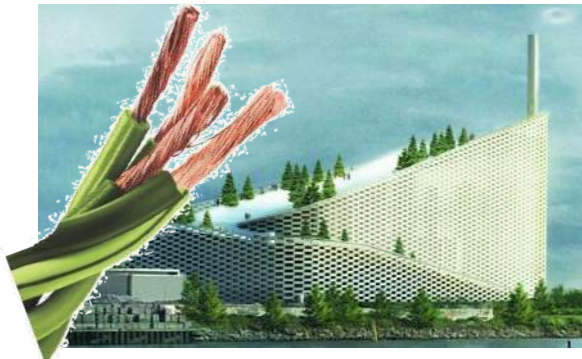
Net balance of recycling 2020 1,76

€/100 m cable

Main results: data cable UPT 5 E PVC

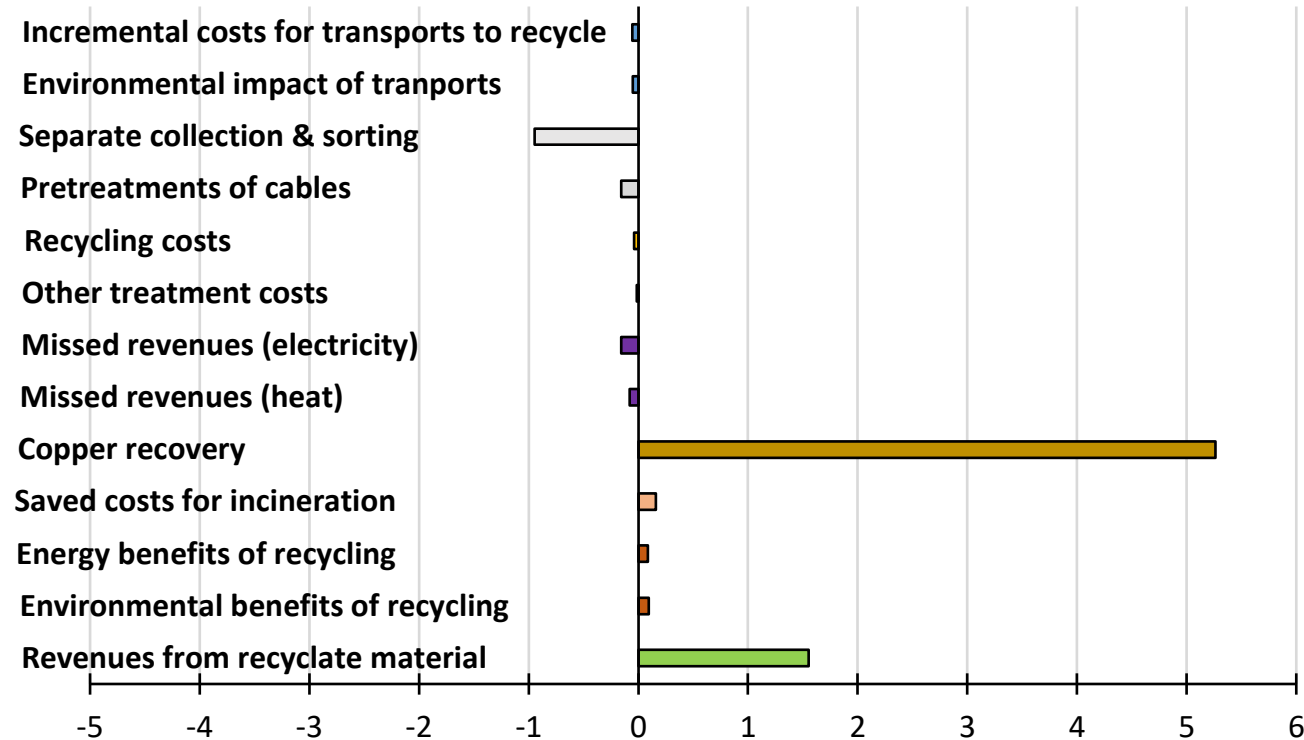


Recycling vs. Incineration with copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022 5,64

Net balance of recycling 2020 3,37

€/100 m cable

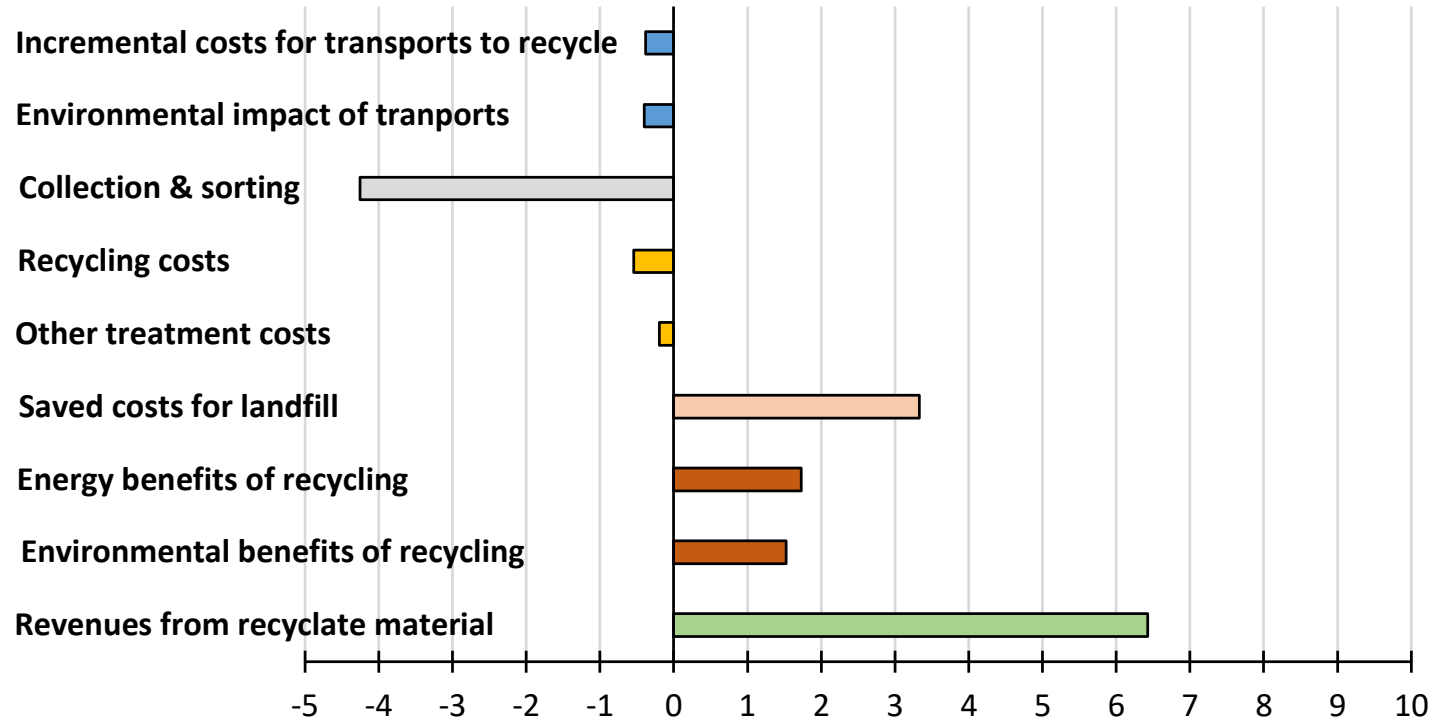
Main results: electricity cable FS 18 OR 18

Recycling vs. Landfill without copper recovery monetization



COSTS

BENEFITS



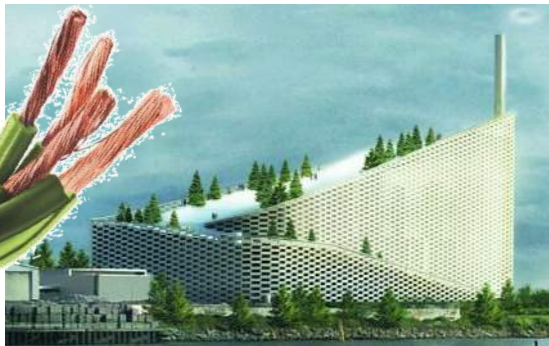
Net balance of recycling 2022 7,61

Net balance of recycling 2020 4,11

€/100 m cable

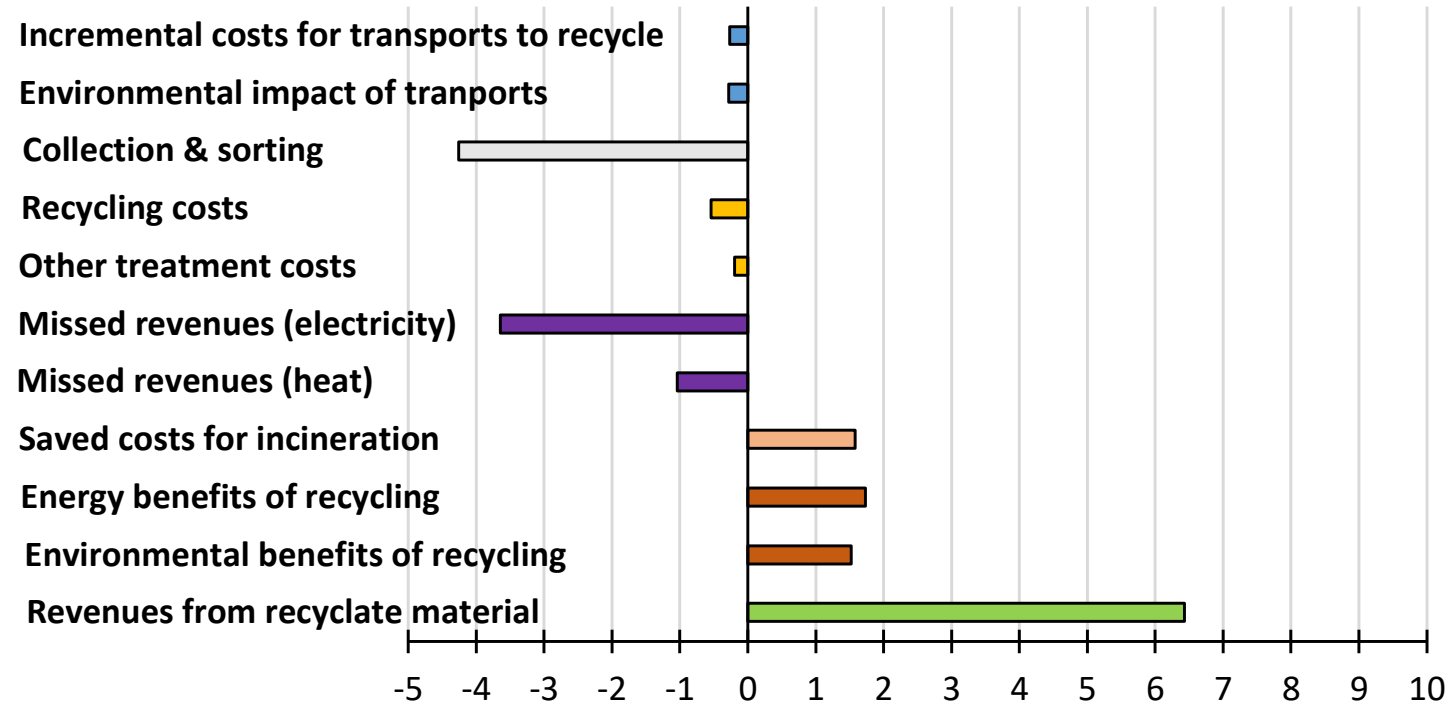
Main results: electricity cable FS 18 OR 18

Recycling vs. Incineration without copper recovery monetization



COSTS

BENEFITS

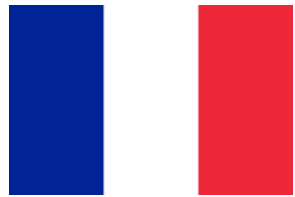


Net balance of recycling 2022 ■ 1,60

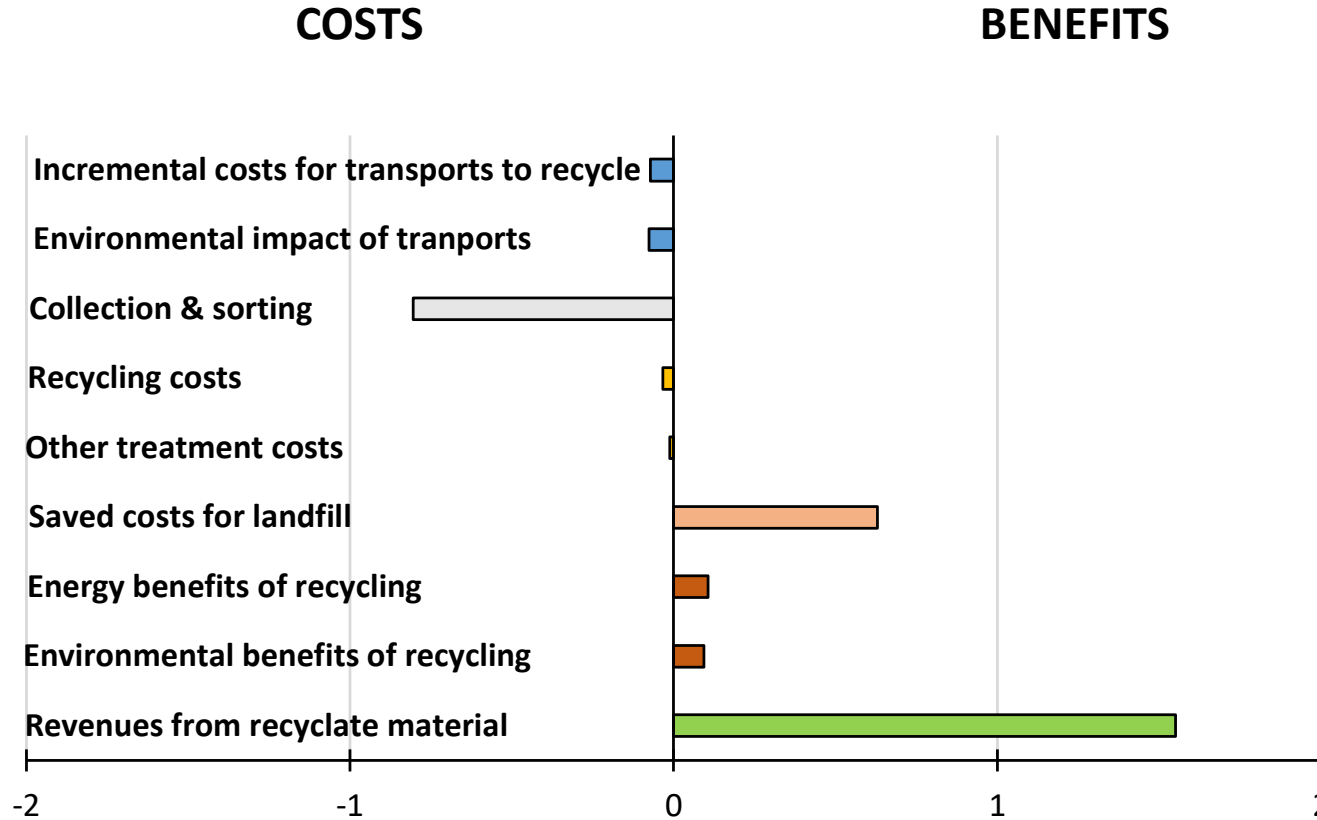
Net balance of recycling 2020 ■ 2,45

€/100 m cable

Main results: data cable UPT 5 E PVC



Recycling vs. Landfill without copper recovery monetization

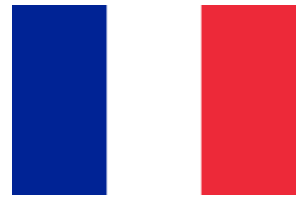


Net balance of recycling 2022 1,45

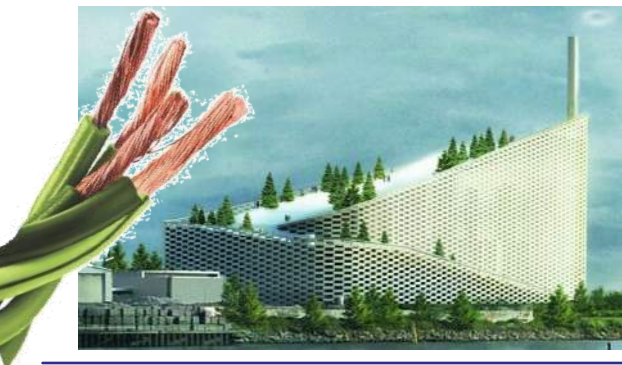
Net balance of recycling 2020 0,79

€/100 m cable

Main results: data cable UPT 5 E PVC

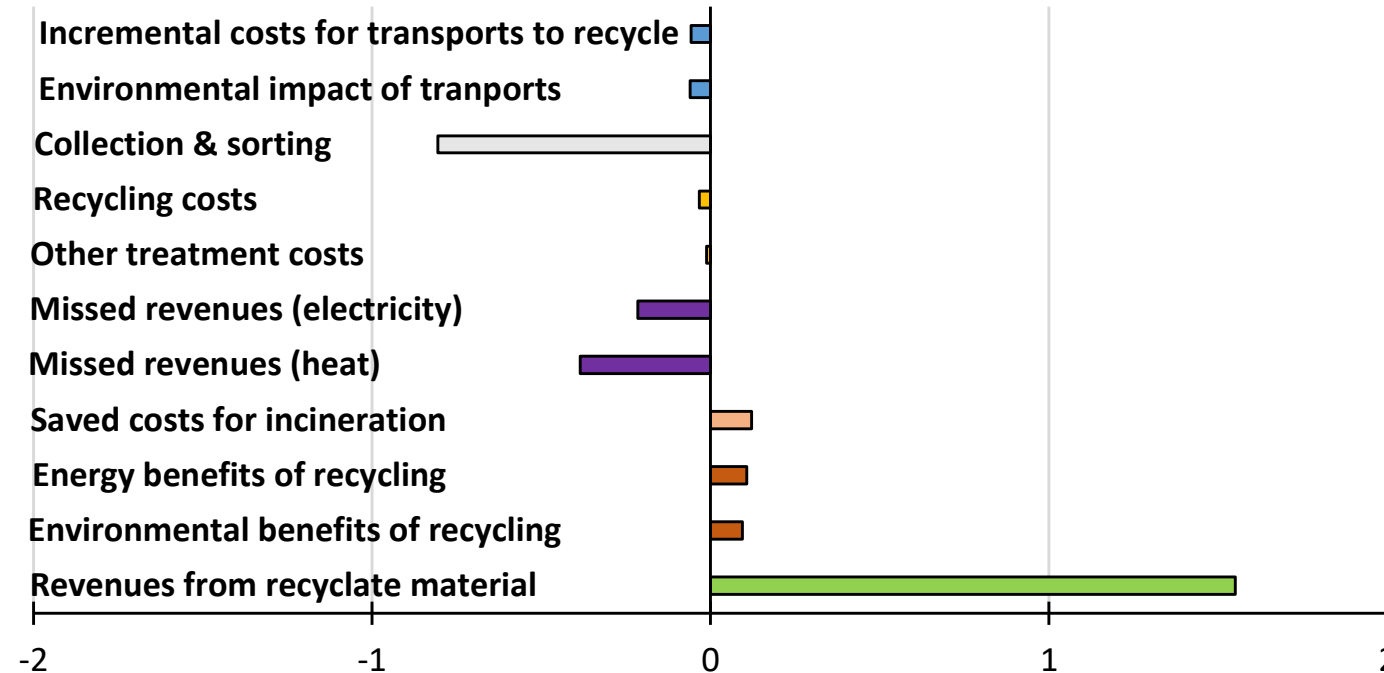


Recycling vs. Incineration without copper recovery monetization



COSTS

BENEFITS



Net balance of recycling 2022 0,31

Net balance of recycling 2020 0,37

€/100 m cable

4. Conclusions



- **The 2022 CBA update confirms a net benefits balance of recycling for all cases and countries.**
- Comparing **recycling vs. landfill** the cable benefits increase in all countries and for all kind of cables
- **Recycling vs. incineration:** the rise of power and gas prices reduces net benefits (still positive), in particular for countries with higher energy prices (Italy) due to energy recovery (electricity and heat) during incineration.
- However, the possible future inclusion of incineration under ETS system could modify the results of CBA, improving the net benefit of recycling vs. incineration.
- For the cables a **key factor** of CBA is the **copper scrap** price that increased of 62% between 2020 and 2022. As a consequence, all solutions with copper recovery show a greater net benefit. Higher is the quantity of copper in the cable (electric vs. data) and higher is the net benefit.

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