SESSION 2: 9:00–9:30

ESTEP workshop

SecCarb4Steel

Preparation and use of biogenic and non-biogenic secondary carbon carriers (SCC) in processes for iron and steelmaking

Decarbonisation through recycling and industrial symbiosis: The use of recycled carbon raw materials in steelmaking

Elia Gosparini

[1] I.BLU (Iren Group)

CHALLENGES TO DECARBONIZE THE STEEL INDUSTRY

The metallurgical sector is a *hard-to-abate* industry facing enormous challenges in the intent to cut down CO_2 emissions in accordance with the Green Deal. For some of the technologies on the table, important barriers still need to be overcome.

CURRENT BARRIERS

HYDROGEN &CCUS

- Infrastructure
- Scalability
- Time
- Cost

BIOMASS

- Availability
- Competition with energy sector
- Price

THE USE OF RECYCLED POLYMERS IN STEELMAKING

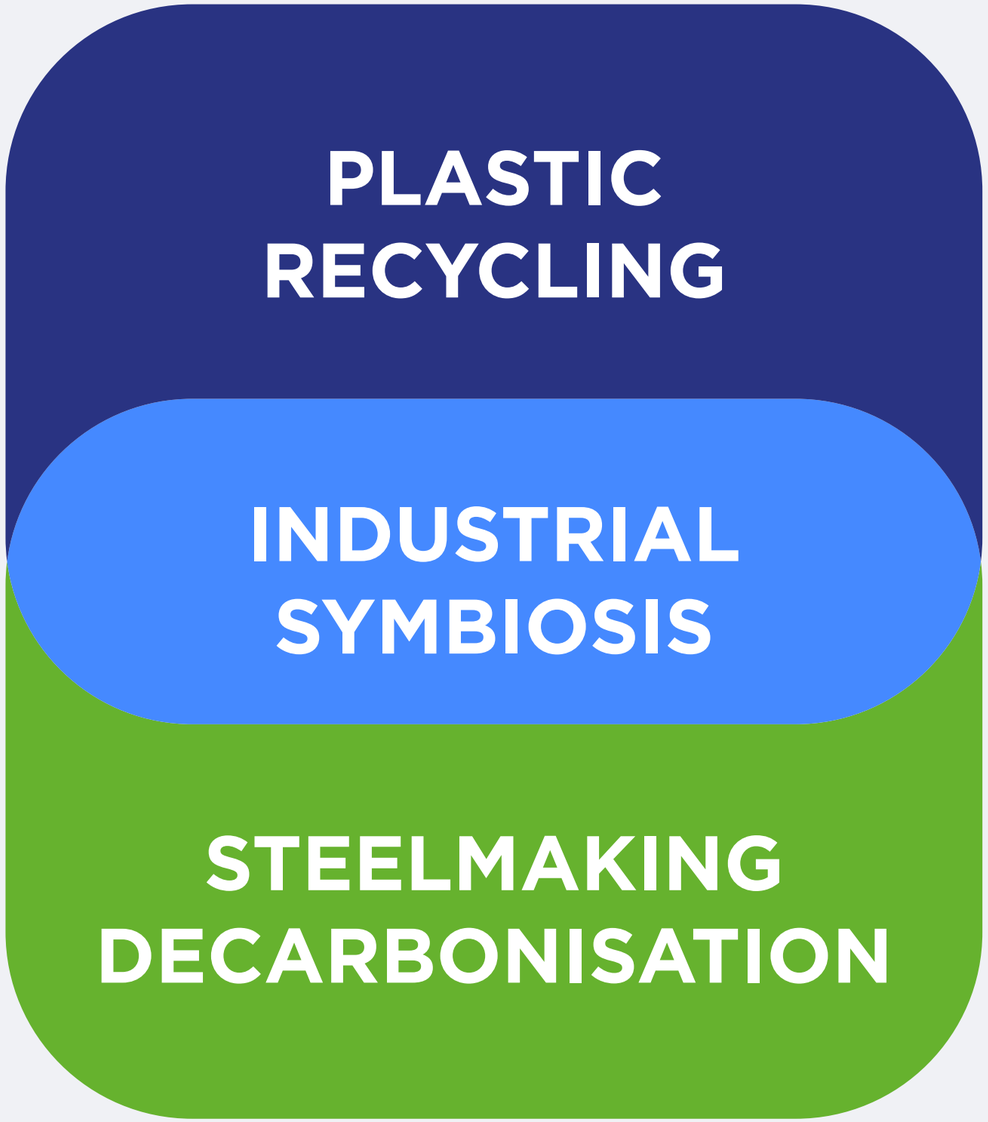
It is no silver bullet but can immediately contribute to decarbonization of the metallurgical sector and to the **circular economy** by substituting virgin coal.

AVAILABLE OPPORTUNITY

RECYCLED POLYMERIC CARBON-CARRIERS

from plastic packaging waste used as reducing/ foaming agents in substitution of coal in EAF and BF:

- Consolidated
- Available on an industrial scale
- Economically sustainable



INDUSTRIAL SYMBIOSIS: BEYOND THE MARKET MISMATCH

About **10MLN ton** of plastic packaging waste in the EU are currently not recycled. They represent a significant **feedstock** to substitute:

- **3MLN ton of PCI in BF**
  (considering 20% substitution)
- **1,08 MLN ton of coal in EAF**
  (considering 30% substitution)

BLUAIR®

BLUAIR® is a reducing/foaming agent developed by I.Blu, to be used in EAF and BF in substitution of virgin coal.

It's a **recycled raw material** deriving from plastic packaging waste to be used for the technical functions foreseen by the standard UNI 10667-17:2021.

This solution can compensate for the scarcity of virgin coal in the EU and enable local sourcing at a fair price, enhancing the sector's **independence from extra-EU imports.**

Politecnico di Torino

Dipartimento di Ingegneria dell'Ambiente, del Territorio e delle Infrastrutture

Evaluation of the environmental benefits deriving from the use of BLUAIR product in steel production according to the UNI 10667-17:2021 standard, also considering the national established recycling targets

Report Phase II

Prof.ssa Mariachiara Zanetti
Prof.ssa Barbara Ruffino
Prof.ssa Deborah Panepinto

18th october 2022

NO NEGATIVE IMPACTS ON INDUSTRIAL EMISSIONS

The study investigated the environmental benefits deriving from the use of BLUAIR® in three Italian EAF steelworks. The report showed that:

- BLUAIR® has no negative impacts on the quality of the emissions and ensures full **compliance with threshold values**;
- PAHs, PCBs, PCDD/PCDF, dusts, NOx, and heavy metals were similar or beneficial compared to the standard practice (only coal).

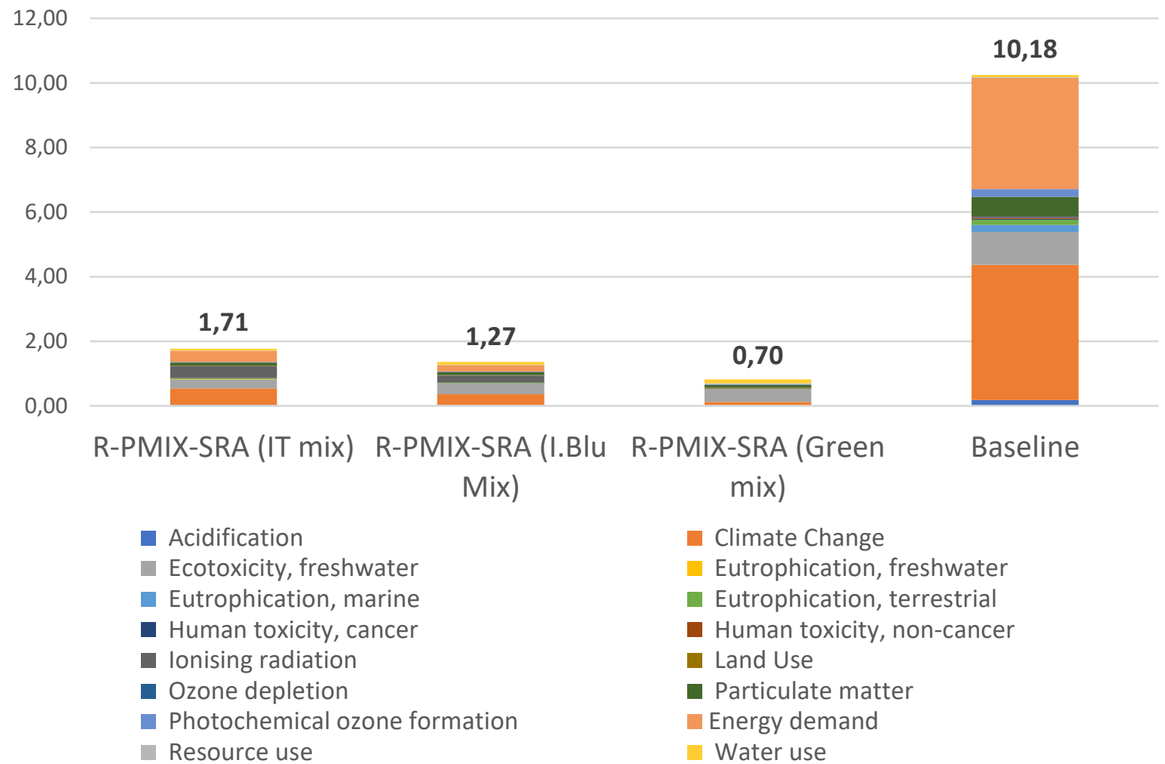
PROJECT NUMBER
RFCS 899415
PROJECT ACRONYM
ONLYPLASTIC
PROJECT TITLE
EAF WORKING WITH POLYMERS DERIVED FROM PLASTIC RESIDUE IN SUBSTITUTION OF FOSSIL FUEL

PROJECT COORDINATOR

ONLYPLASTIC PROJECT

The project aimed at the substitution of virgin coal in the Feralpi EAF steelwork with the recycled polymer product (BLUAIR®). Within the project an LCA study was performed by RINA CSM regarding the production of BLUAIR® and its use in EAF.

The research leading to these results has received funding from the European Union's Research Fund for Coal and Steel research program under grant agreement number 899415



Single-score analysis comparing the impacts related to the innovative scenario (production of BLUAIR®) with the baseline scenario (incineration of mixed plastics and supply of coal).

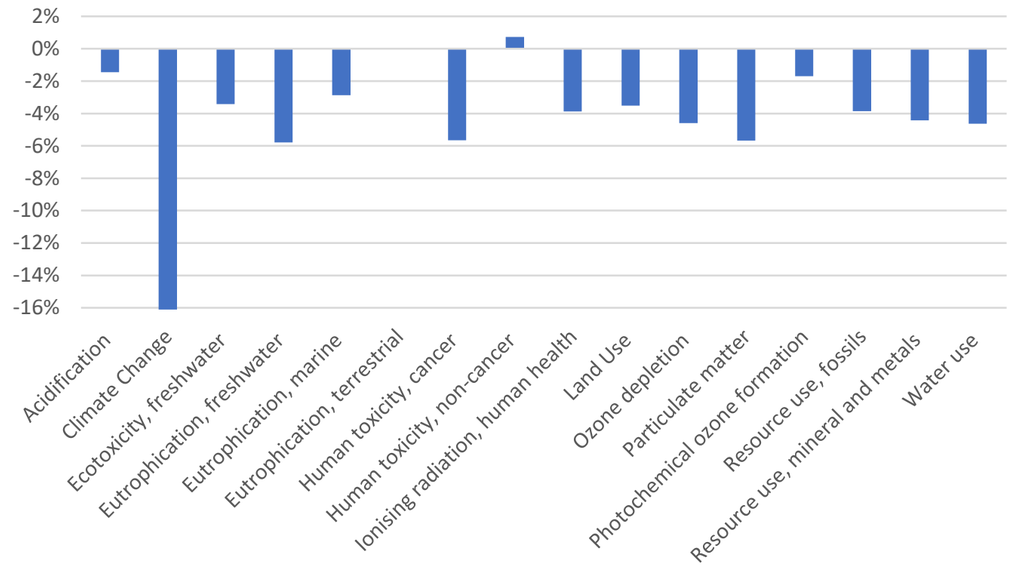
LCA: BLUAIR® PRODUCTION VS INCINERATION AND DISPOSAL OF PPW

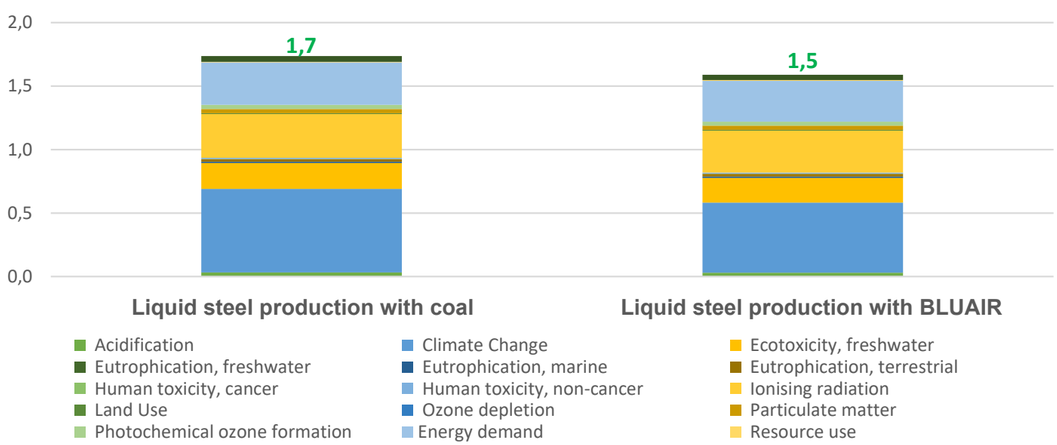
The LCA performed by Rina CSM confirmed that the use of recycled carbon raw materials (BLUAIR®) in EAF is beneficial in most environmental impact categories.

The baseline scenario (incineration/disposal of mixed plastic waste) was compared to three different innovative scenarios (BLUAIR® production).

Based on the single-score analysis, even in the worst-case scenario, BLUAIR® enables **-83% impact reduction**.

The research leading to these results has received funding from the European Union's Research Fund for Coal and Steel research program under grant agreement number 899415





LCA: BLUAIR® IN EAF VS COAL

The second part of the study compares the impacts of liquid steel manufacturing with coal and with BLUAIR® as its replacement.

An average reduction of 4 % was found when BLUAIR® is used as carbonaceous material, in particular a **16% reduction in climate change and 6 % reduction in human toxicity (cancer) were found.**

Figure 1: Reduction of environmental impacts due to the substitution of coal.
Figure 2. Single-score analysis comparing baseline and innovative scenario in EAF.

The research leading to these results has received funding from the European Union's Research Fund for Coal and Steel research program under grant agreement number 899415

LCA: BLUAIR® IN EAF

[...]

3.4. Interpretation of Results

This work provides a comprehensive life cycle assessment (LCA) study focusing on the environmental impact of producing steel with a conventional carbon source and an innovative one produced from waste plastic. The study compares the environmental performance of liquid steel manufacturing with coal and with BLUAIR®, produced by I.BLU, as its replacement.

The study evaluates various impact categories such as acidification, climate change, ecotoxicity, eutrophication, human toxicity, ionizing radiation, land use, ozone depletion, particulate matter emissions, photochemical ozone formation, resource use (fossils and minerals), and water use.

The results indicate that the implementation of BLUAIR® in steel manufacturing generally performs better than the conventional scenario, with lower environmental impacts. A single score analysis shows lower overall impact of BLUAIR implementation when compared with coal. Hotspot analysis shows that the electricity production phase is the primary contributor to most impacts, while BLUAIR production phase has negligible impacts in all categories.

Overall, the LCA study demonstrates the positive environmental impact of using BLUAIR as replacement of coal in steel industry. The findings can guide decision-making and promote more sustainable practices in the steel manufacturing field.
[...]

The research leading to these results has received funding from the European Union's Research Fund for Coal and Steel research program under grant agreement number 899415

RECYCLED CARBON AND DECARBONIZATION

Incentivizing the use of recycled carbon would be at the core of a sustainable economic model, where:

- MORE RECYCLING
- LESS INCINERATION
- PLASTIC TAX REDUCTION

- SUBSTITUTION OF VIRGIN RAW MATERIALS
- INDEPENDENCE FROM EXTRA-EU IMPORTS OF COAL

- DECARBONIZATION
- CARBON STORAGE PRESERVATION
- INDUSTRIAL SUSTAINABILITY

LAST 3 YEARS

>150.000 TON

recycled plastics

A CONSOLIDATED INDUSTRIAL SOLUTION

The use of recycled polymeric carbon carriers is a consolidated industrial solution, the demand of which is steadily growing.

Only in the last three years, it was possible to recycle more than **150Kton** of plastics that could not be recycled for traditional applications.

establishing a

ZERO-RATED EMISSION FACTOR

for recycled carbon in EU-ETS

THE ROLE OF THE STEEL INDUSTRY

By uptaking more recycled polymeric carbon carriers the steelmaking industry can contribute to boost climate change mitigation, recycling and EU independence from coal imports.

A joint advocacy activity is necessary to make sure EU institutions introduce appropriate mechanisms to incentivize the substitution of virgin fossil resources with the recycled carbon contained in secondary raw materials.

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