INTEGRATED ENVIRONMENTAL AND ECONOMIC ASSESSMENT OF TECHNOLOGY PROSPECTS: A CASE STUDY OF FLAT GLASS MANUFACTURING

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ABSTRACT

The Fourth Industrial Revolution enables in depth assessment of technology prospects by systematising social, environmental, and other measurable indicators while sustaining economic growth. Although these categories can be integrated into a monetary framework, such unification fails to account for dependencies among resource costs, geographical variations, and business paradigms, thereby introducing significant uncertainties. Economic growth models have long attempted to incorporate social factors. Growth is a function of capital and labour, both of which depend on the efficiency of the technologies employed, while the impetus for change stems from rising demand. These relationships enable an estimation of the long-term investments required to improve living standards. This study proposes incorporating environmental indicators – quantifying negative impacts – into the variable matrix, with defined boundaries. Compliance with these thresholds, alongside conventional economic growth, serves as a measure of a technology's viability. Authors analyse flat glass manufacturing looking at it through the lens of economic and environmental shifts following the phase-out of obsolete technologies. This study establishes boundaries for qualitative and quantitative indicators and examines their interrelation. Findings suggest that policies promoting resource efficiency align with sustainable development principles, fostering economic growth while mitigating ecological harm.

Keywords: sustainable development, resource efficiency, integrated assessment, economic model, impact boundaries, flat glass

INTRODUCTION

Flat glass manufacturing is a well-developed and technologically advanced sector of the global economy. At the turn of the 21st century, industry underwent a widespread shift from outdated glass-drawing methods, using installations with a capacity of 250-350 tonnes per day, to the modern float glass process (using a bed of molten tin), which operates at capacities of 600-800 tonnes per day [1]. This advanced technology not only enhances productivity but also ensures superior product quality, minimizes defects, and

https://doi.org/10.5593/sgem2025/5.1/s20.042