

A PRELIMINARY SOCIAL ASSESSMENT OF INNOVATIVE MANAGEMENT OPTIONS FOR MIXED AND HAZARDOUS PLASTICS WASTE

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Recyclability of plastics from waste of electric and electronic equipment (WEEE), end-of-life vehicles (ELV) and construction and demolition waste (C&DW) is a technological and economic challenge. It is complicated by their composition, which includes many polymers with high levels of contamination, as well as the large costs of treatments and the continuous evolution of the related legal framework (Ardolino et al., 2021; Cardamone et al. 2022). Innovative treatments able to remove contained contaminants, so generating secondary plastics of good quality and reducing adoption of improper strategies, were recently proposed in a H2020 project (Nontox, 2021). The good environmental performances of management schemes utilising these treatments for WEEE/ELV/C&DW plastics were quantified by means of Environmental Life Cycle Assessments (E-LCAs) as described by Ardolino et al. (2021) and Cardamone et al. (2022). The potential social impacts of these management schemes have been the focus of the preliminary Social Life Cycle Assessment (S-LCA) described in this study. It was developed in agreement with UNEP guidelines (2020) and ISO standards (ISO 14040-44). The analysis maintained the basic assumptions of the E-LCAs, in particular saving the management of WEEE/ELV/C&DW plastics annually collected in Europe as the functional unit. The current management scheme of each of them, including waste-to-energy (WtE) by combustion, sanitary landfilling and substandard options, were compared with the possible future scheme, implementing also innovative treatments of physical recycling (CreaSolv® and Extruclean), plastic upgrading and catalytic pyrolysis. Workers, Local communities, and Society are stakeholders of interest, for which related social topics were assessed (Table 1). Data collection did not involve stakeholders directly neither considered site-specific conditions, since the analysis was developed at European level and it refers to systems to be still implemented. Hence, the inventory stage was developed by means of questionnaires and interviews with a panel of experts in the field, as suggested by UNEP (2020). The answers were evaluated with a reference scale for each social theme, and final results were obtained by developing a weighted average of all answers. Substandard options were not included in the questionnaire, since their awful social impacts (mainly due to the presence of child labour and the exposure of workers/local community to unsafe conditions) were clearly highlighted by available literature (Ardolino et al., 2021). Results showed that the risks for workers to be exposed to damages for human health are medium-low for innovative processes and WtE, being instead high for sanitary landfill. Physical recycling processes are perceived as low-risk options also for safe and healthy conditions of local communities, even though large part (about 50%) of the experts declared to have no enough data to give a reliable answer for innovative solutions.

| Stakeholders | Work ers | Local communities | | | Society | |
|------------------------|-------------------------|--|-------------------------------------|---|-----------------------------------|-------------------------------------|
| | Health and Safety | Safe and healthy conditio ns | Econo mic devel opme nt | Public commitme nt to sustainabil ity | Technol ogy develo pment | Econo mic devel opme nt |
| WtE | 0.12 | -0.71 | 0.62 | 1.59 | 0.08 | |
| Sanitary landfill | -0.09 | -1.1 | -0.2 | 1.50 | -0.8 | |
| CreaSolv | 0.44 | 0.12 | 0.79 | 1.44 | 1.06 | 0.69 |
| Extruclean | 0.53 | 0.65 | 0.91 | 1.38 | 1.49 | |
| Pyrolysis | 0.29 | -0.41 | 0.82 | 1.50 | 1.41 | |
| Substandard options | -2 | -2 | -2 | -2 | -2 | -2 |

Table 1 – Preliminary S-LCA results with reference to each management option. Reference scale: -2, very poor performance; -1, poor performance; 0, average performance/no shared position from experts; +1, good performance; +2, very good performance.

Almost all the options are considered to be useful for local economic development, by promoting higher (direct and indirect) employment level and new satellite activities, in some cases also at national level. The medium technological readiness level of the innovative processes, which necessary must be increased to allow their implementation on industrial scale, is considered as a driver of improved technological development of the society. On the other hand, the identification of the optimal scales as well as the availability of economic incentives are both perceived as crucial for all the innovative solutions.

2022. Sustainable Production and Consumption, 29, 115-127; ISO 14040-14044 (2006): Environmental Management - Life Cycle Assessment; NONTOX Project, 2021. <http://nontox-project.eu/>; UNEP (2020) Guidelines for Social Life Cycle Assessment of Products and Organizations.

REFERENCES: Ardolino, F., Cardamone, G.F., Arena, U., 2021. Waste Management, 135, 347-359; Cardamone, G.F., Ardolino, F., Arena, U.,