

What is NONTOX project?

(Text is from the accepted funding application by Nontox consortium)

NONTOX aims to develop a cost-effective solution able to increase the recycled volume of the plastic fractions contaminated by legacy additives and other substances of concern, from three key waste streams (WEEE, C&DW and ELV) realising the creation of recycled plastic material (recyclate) characterised by high quality and safety standards. Additionally NONTOX solutions will enable to manage hazardous substances effectively, purifying and reintroducing them in the production cycle.

NONTOX Objectives

In our everyday life, plastic is a widely diffused and important material, employed in so many different uses, showing fast growth in both standard and high-tech applications. According to the latest statistics, the European plastic demand is almost 50 Mt (2016) of which 6.2 % (~3.1 Mt) in Electrical and Electronics Equipment (EEE) sector; almost 20 % (~10 Mt) in Construction sector; and 10% (~5Mt) in the Automotive sector. NONTOX will focus on the waste plastics from all these sectors.

While the plastic recycling rate has increased in recent years, only about 30% of the material collected is recycled today, the remaining being treated with non-circular solutions (landfill and incineration). This recycling rate is too modest taking into consideration EU directives, plastic strategy set for 2020 by the European Commission for WEEE (Waste of Electrical and Electronic Equipment, Directive 2012/19/EU), ELV (End-of-Life Vehicles, Directive 2000/53/EC) and C&DW (Construction & Demolition Waste) streams (WFD 2008/98). The plastic recycling targets are estimated to be almost 45% for WEEE, 30% for ELV and 36% for C&DW according to a report by Deloitte. These waste streams are hindered by the presence of hazardous substances (for example, 30% of the WEEE plastics contain flame-retardants are generally incinerated or landfilled, with potentially harmful consequences for human health and the environment. This specifically is due to a lack of techno-economically reliable, environmentally sustainable and cost effective recycling processes.

According to the European plastics strategy for a circular economy, it is a priority to 'prepare a plan for addressing the challenges posed by plastics throughout the value chain and taking into account their entire lifecycle'. Today, the demand for recycled plastic attains only 6 %, due to multiple factors including barriers of resin purity, heritage additives, deteriorated properties, comparative cost with

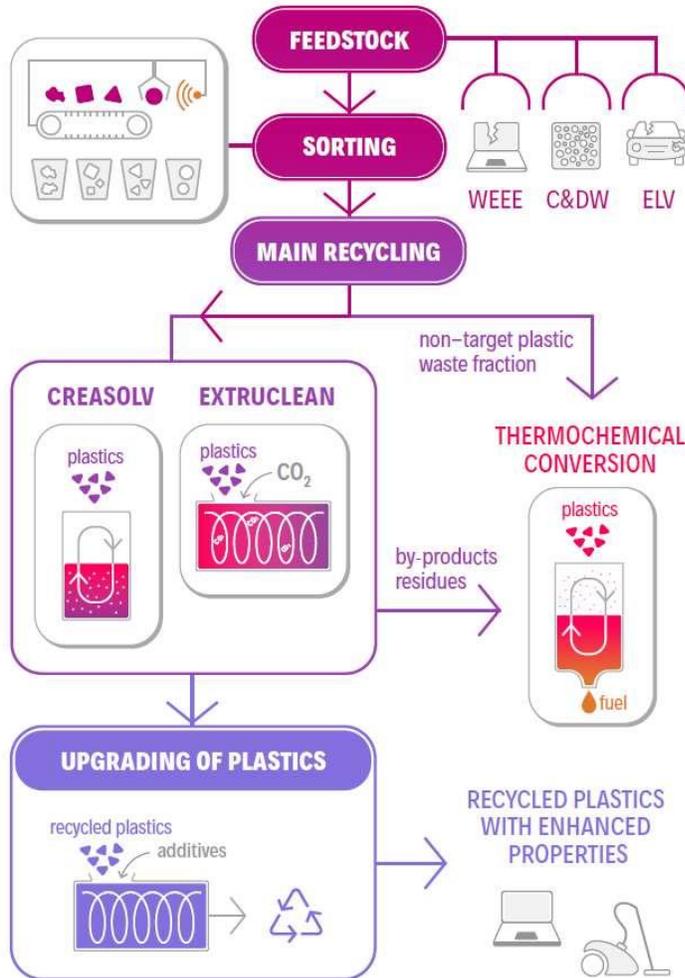
virgin plastic and most importantly the mistrust of plastic product manufacturers due to lack of quality standards for recycled plastics. The uncertainty and lack of information about the possible presence of chemicals of concern is an added problem for various plastic waste streams. It significantly hinders the use of recycled plastics in applications with specific safety pre-requisites. The identification of hazardous additives in plastic streams and the development of cost-effective plastic recycling solutions are a challenge to create viable markets for recycled plastics. It is therefore necessary to conceive “a new plastics economy”, where not only the design and production of plastics but also the plastic recycling processes and technologies allow the development and promotion of sustainable and reliable materials.

NONTOX focuses on the safe removal of hazardous and undesired substances from selected plastic waste streams. To ensure an appropriate process effectiveness, NONTOX takes into account the whole value chain, from sorting of the waste to valorisation of recycled products and safe utilisation of removed hazardous substances. In particular, NONTOX will target material recovery of valuable plastics, originating from the WEEE, ELV and C&DW streams. The project will focus on plastic fractions containing hazardous additives or undesired compounds such as several groups of flame-retardants, heavy metal bearing stabilisers, fillers, or organic colorants, POPs (Persistent Organic Pollutants) listed in the Stockholm convention. The identification and removal of these substances is crucial as their presence currently hampers the plastic waste stream’s recyclability leading to their incineration or landfill.

NONTOX Concept

The demand for recycled plastics in Europe is low and limited to 6% of the total plastics market (EU Plastics Strategy) and the application of recycled plastics is most often limited to low-value or niche applications. This situation discourages private investments in recycling capacities and in recycling technologies. In addition to the quality drop resulting from the far-from-optimal separation of polymer types and even within one polymer type, the low use of recycled plastics is also originated from the misgivings of many product brands and manufacturers, who fear that recycled plastics will not meet their needs for a reliable, high-volume supply of materials with constant quality specifications. Removal of hazardous substances from pre-sorted plastic waste can be very costly and creates complex flow of side streams (e.g. low-quality plastic resins, hazardous substances removed from original feedstock). To increase the efficiency and competitiveness of the recycled plastics, it is necessary to integrate the entire plastic waste management system with convenient treatment and management methods, serving the ultimate goal of increasing the use of secondary plastics. The systematic approach of NONTOX

project will target the complex fraction of plastic waste and will offer solutions for other non-target polymers and process residues consequently transforming hazardous plastic waste into safe and reliable products.



The overall concept of the NONTOX project is to increase the recycling rate of plastics from WEEE, ELV and C&DW streams by addressing the above mentioned challenges with a value chain approach. The core of the project consists in removing hazardous additives currently present in plastic products and plastic waste such as legacy flameretardants (PBDEs - Polybrominated diphenyl ethers), which hinder recyclability. Residues and non-target polymers will be valorised into halogen-free liquid fuels, to partially compensate the energy requirement of the recycling processes increasing economic and environmental efficiency. Other products will also be developed by the residues treatment such as solvents and aromatics.

The European Commission has committed to promote the development of international standards to boost industry confidence in the quality and safety of recyclate. Current market for post-consumer recycled plastic is low because it would be nearly impossible to warrant a stable quality of the fraction considering the whole end-of-life chain is not controlled and is not working according to guidelines and standards. Products are not designed to facilitate recyclability of different parts and this limit the recovery of plastic waste into new applications. Consumers and public in general have low confidence on the safety of products containing recyclate. NONTOX will address also these market and framework barriers by developing the standardisation and product eco- design recommendations, a comprehensive business plan to facilitate the market approval of the project's results and a dissemination and communication campaign to increase the consumer's confidence in secondary plastics.

NONTOX Methodology

NONTOX will focus on three main plastics waste streams WEEE, ELV and C&DW, more specifically targeting the contaminated plastic fraction, which today is sent to disposal. These plastic streams make up for 16 % of the annually generated plastic waste in Europe and should, thus, be considered for recycling instead of disposal (addressing the agenda in the plastic strategy for increased recycling). The polymers present in the three feedstock are similar in many cases and can thus be generalised in some sections of the work. It is also common with combined treatment of large WEEE and ELV due to their similar material content and properties. The three chosen feedstock, owing to their nature of application, are commonly equipped with chemical to improve the properties of the material, such as flame retardants; paint, pigments and colorants; additives, such as softeners and plasticisers; catalysts; stabilizers and blowing agents. Many of the chemicals used in these plastics are found to be harmful for health and the environment. Following this, these plastic fractions are forbidden for recycling until free from such flame retardants.

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