**Supplementary Materials**

**Table S1.** General assumptions of EoL treatment pathways in different regions for base case scenario (2018).

| EoL pathways [%] | Multilayer | Rigid PP | Rigid PET | Foamed | PLA |
|---|---|---|---|---|---|
| **Europe** | | | | | |
| Share to incineration | 65.7 | 38.8 | 65.7 | 65.7 | 65.7 |
| Share to landfill | 34.3 | 20.3 | 34.3 | 34.3 | 34.3 |
| Share to RDF | 0 | 0 | 0 | 0 | 0 |
| Share to recycling | 0 | 40.9 | 0 | 0 | 0 |
| **Italy** | | | | | |
| Share to incineration | 66.5 | 39.8 | 66.5 | 66.5 | 66.5 |
| Share to landfill | 33.5 | 20 | 33.5 | 33.5 | 33.5 |
| Share to RDF | 0 | 0 | 0 | 0 | 0 |
| Share to recycling | 0 | 40.2 | 0 | 0 | 0 |
| **France** | | | | | |
| Share to incineration | 69.5 | 45.5 | 69.5 | 69.5 | 69.5 |
| Share to landfill | 30.5 | 20 | 30.5 | 30.5 | 30.5 |
| Share to RDF | 0 | 0 | 0 | 0 | 0 |
| Share to recycling | 0 | 34.5 | 0 | 0 | 0 |
| **Germany** | | | | | |
| Share to incineration | 99.8 | 40.4 | 99.8 | 99.8 | 99.8 |
| Share to landfill | 0.2 | 0.6 | 0.2 | 0.2 | 0.2 |
| Share to RDF | 0 | 20.2 | 0 | 0 | 0 |
| Share to recycling | 0 | 38.8 | 0 | 0 | 0 |

Materials & Processes

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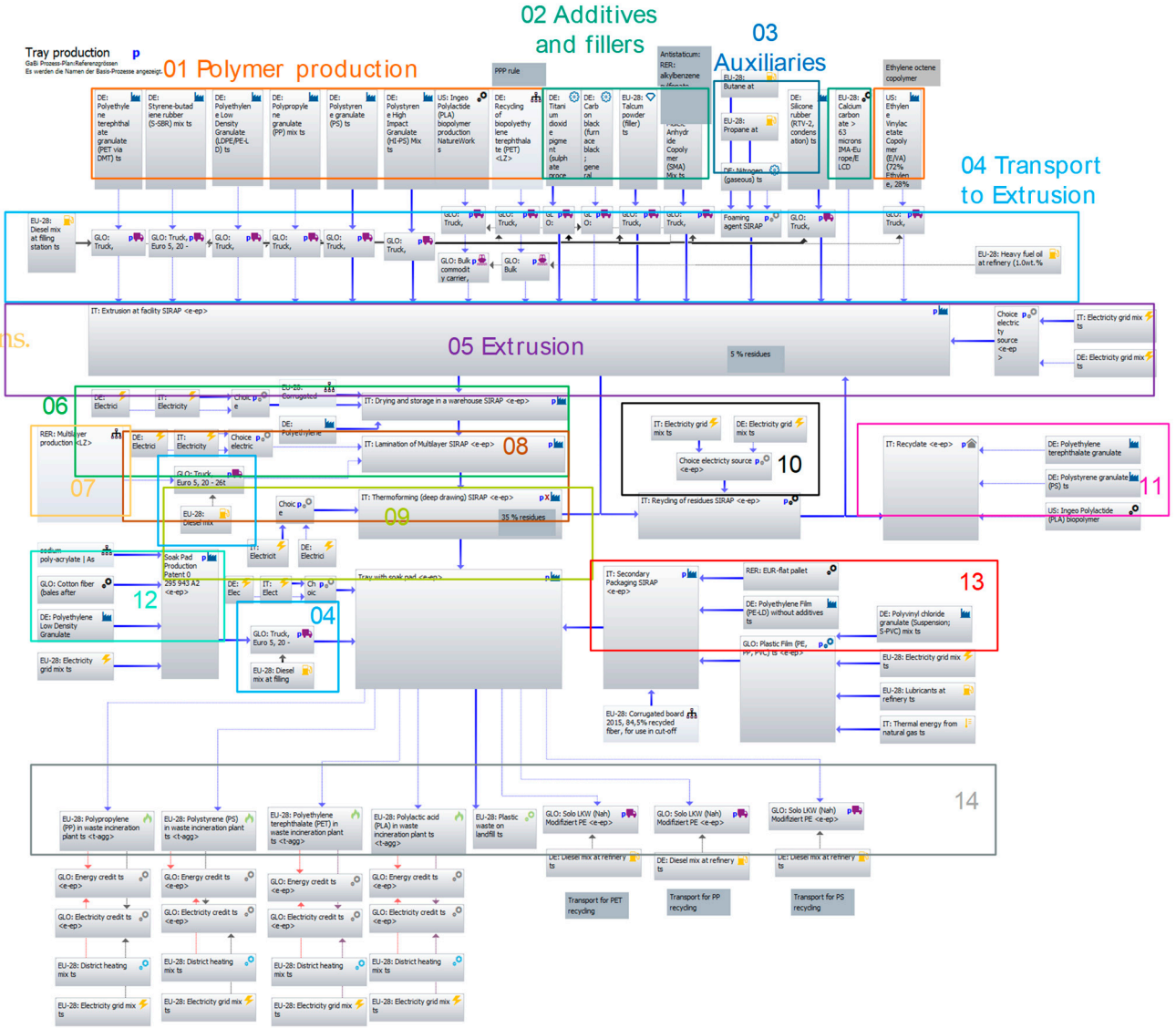


**Figure S1.** LCA model in the GaBi-software.

**Table S2.** Background data taken to model material and energy demands.

| Materials and energy | Background dataset |
|---|---|
| **Polymer production** | |
| Polyethylene terephthalate granulate | DE: Polyethylene terephthalate granulate (PET via DMT) ts |
| Recycled polyethylene terephthalate granulate (rPET) | DE: Recycling of polyethylene terephthalate (PET) |
| Polyethylene low density granulate | DE: Polyethylene Low Density Granulate (LDPE/PE-LD) ts |
| Polypropylene granulate | DE: Polypropylene granulate (PP) mix ts |
| Polystyrene granulate | DE: Polystyrene granulate (PS) ts |
| Polystyrene high impact granulate | DE: Polystyrene High Impact Granulate (HI-PS) Mix ts |
| Polylactide | US: Ingeo Polylactide (PLA) biopolymer production NatureWorks |
| Ethylene vinylacetate copolymer | US: Ethylene Vinylacetate Copolymer (E/VA) (72% Ethylene, 28% Vinylacetate) ts |
| Styrene-butadiene copolymer | DE: Styrene-butadiene rubber (S-SBR) mix ts |
| Additives and fillers | |
| Colorants: titanium dioxide | DE: Titanium dioxide pigment (sulphate process) ts |
| Colorants: black | DE: Carbon black (furnace black; general purpose) ts |
| Talc master | EU-28: Talcum powder (filler) ts |
| Antistatic agent | DE: Styrene Maleic Anhydride Copolymer (SMA) Mix ts |
| Calcium carbonate | EU-28: Calcium carbonate > 63 microns IMA-Europe/ELCD |
| **Auxiliaries** | |
| Butane | EU-28: Butane at refinery ts |
| Propane | EU-28: Propane at refinery ts |
| Nitrogen | DE: Nitrogen (gaseous) ts |
| **Multilayer production** | |
| Polystyrene granulate | DE: Polystyrene granulate (PS) ts |
| Anhydride modified copolymer based on styrenic and ethylenic copolymers | US: Ethylene/methacrylic acid ionomer (EMAA) ts |
| Ethylene vinyl alcohol copolymer | DE: Ethylene vinyl alcohol copolymer (EVOH) ts |
| Maleic anhydride grafted PE adhesive | EU-28: Polyester hot-melt for the textile industry ts |
| Polyethylene low density granulate | DE: Polyethylene Low Density Granulate (LDPE/PE-LD) ts |
| Ethylene vinyl acetate copolymer | US: Ethylene Vinylacetate Copolymer (E/VA) (72% Ethylene, 28% Vinylacetate) ts |
| European electricity grid mix | EU-28: Electricity grid mix ts |
| European thermal energy from natural gas | EU-28: Thermal energy from natural gas ts |
| Lubricants | EU-28: Lubricants at refinery ts |
| **Credit residues** | |
| Polyethylene terephthalate granulate | DE: Polyethylene terephthalate granulate (PET via DMT) ts |
| Polystyrene granulate | DE: Polystyrene granulate (PS) ts |
| Polylactide | US: Ingeo Polylactide (PLA) biopolymer production NatureWorks |
| **Absorption pad** | |
| Super Absorbent Fibre (SAF) Sodium poly-acrylate [25] | EU-28: Acrylic acid (Propene) ts<br>DE: Ammonium sulphate mix (by-product) ts<br>EU-28: Process water ts |

| | |
|---|---|
| | DE: Electricity grid mix ts |
| | RNA: Sodium hydroxide, production mix, at plant ts |
| Cellulose fibers | GLO: Cotton fibre (bales after ginning) CottonInc |
| Film | DE: Polyethylene Low Density Granulate (LDPE/PE-LD) ts |
| Electricity | EU-28: Electricity grid mix ts |
| **Transport to extrusion** | |
| Truck transport | GLO: Truck, Euro 5, 20–26 t gross weight/17.3t payload capacity ts |
| Container ship | GLO: Bulk commodity carrier, 5000 to 200,000 dwt payload capacity, ocean going ts <e-ep> |
| Electricity | DE: Electricity grid mix ts |
| | IT: Electricity grid mix ts |
| **Storage of rolls** | |
| PE film | DE: Polyethylene Film (PE-LD) without additives ts |
| Corrugated board | EU-28: Corrugated board 2015, 84,5% recycled fibre, for use in cut-off EoL ts/FEFCO |
| Electricity for forklift | DE: Electricity grid mix ts |
| | IT: Electricity grid mix ts |
| **Lamination** | |
| Electricity | DE: Electricity grid mix ts, IIT: Electricity grid mix ts |
| **Thermoforming** | |
| Electricity | DE: Electricity grid mix ts, IT: Electricity grid mix ts |
| **Recycling of residues** | |
| Electricity | DE: Electricity grid mix ts, IT: Electricity grid mix ts |
| **Secondary Packaging** | |
| Euro-flat pallet | RER: EUR-flat pallet (ecoinvent 3.3) |
| PE film | DE: Polyethylene Film (PE-LD) without additives ts |
| Film production | GLO: Plastic Film (PE, PP, PVC) ts |
| | DE: Polyvinyl chloride granulate (Suspension; S-PVC) mix ts |
| | EU-28: Electricity grid mix ts |
| | EU-28: Lubricants at refinery ts |
| | IT: Thermal energy from natural gas ts |
| Corrugated board | EU-28: Corrugated board 2015, 84.5% recycled fibre, for use in cut-off EoL ts/FEFCO |
| **EoL Tray** | |
| Incineration of PP | EU-28: Polypropylene (PP) in waste incineration plant ts |
| Incineration of PS | EU-28: Polystyrene (PS) in waste incineration plant ts |
| Incineration of PET | EU-28: Polyethylene terephthalate (PET) in waste incineration plant ts |
| Incineration of PLA | EU-28: Polylactic acid (PLA) in waste incineration plant ts |
| Credit for heat | EU-28: District heating mix ts |
| Credit for electricity | EU-28: Electricity grid mix ts |

| | |
|---|---|
| Plastics on landfill | EU-28: Plastic waste on landfill ts |
| Transport to recycling | Solo truck (short-distance, up to 7.5 t total cap./3.3 t payload capacity) |

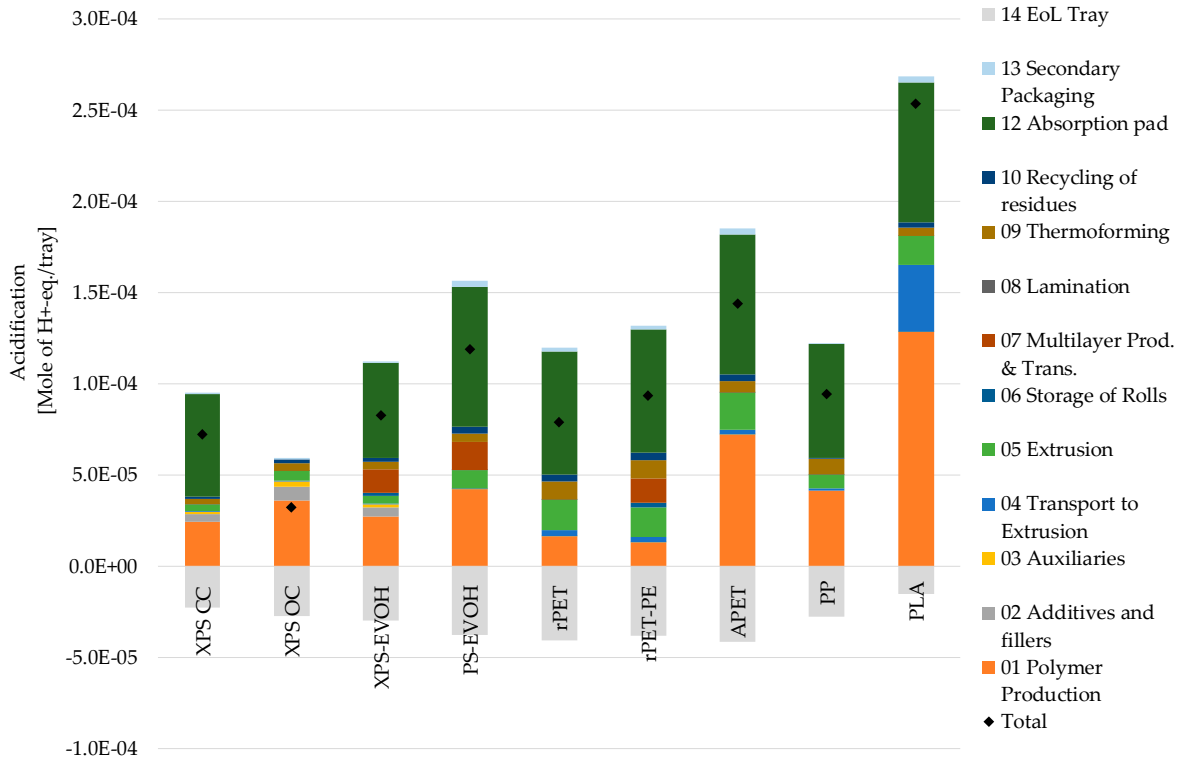


**Figure S2.** Contribution analysis of acidification for all investigated tray solutions.

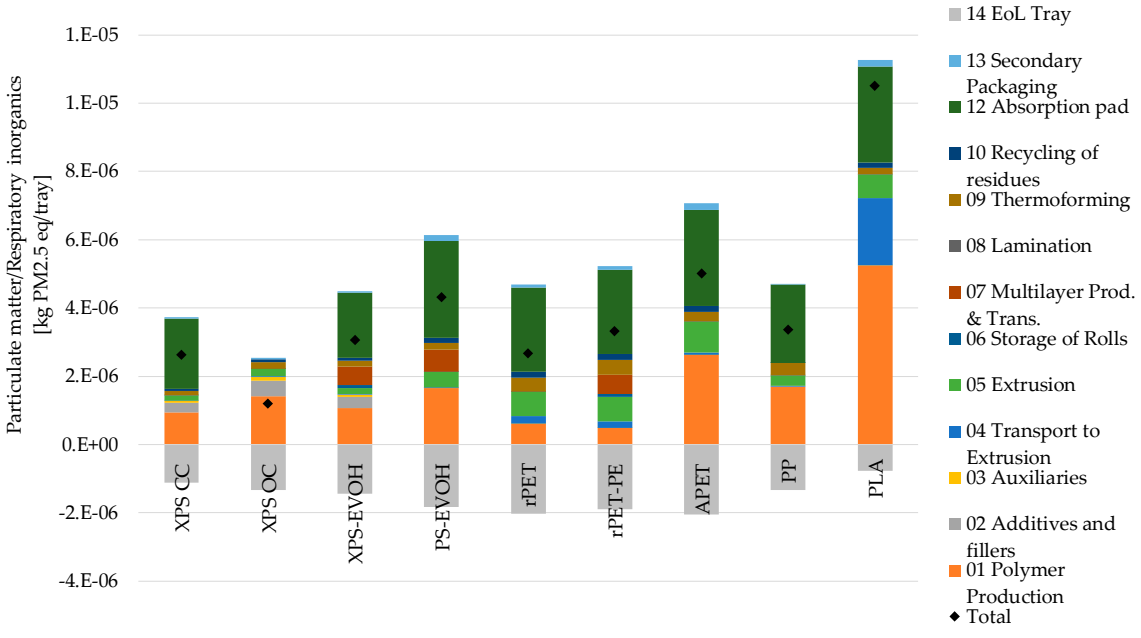


**Figure S3.** Contribution analysis of particulate matter for all investigated tray solutions.

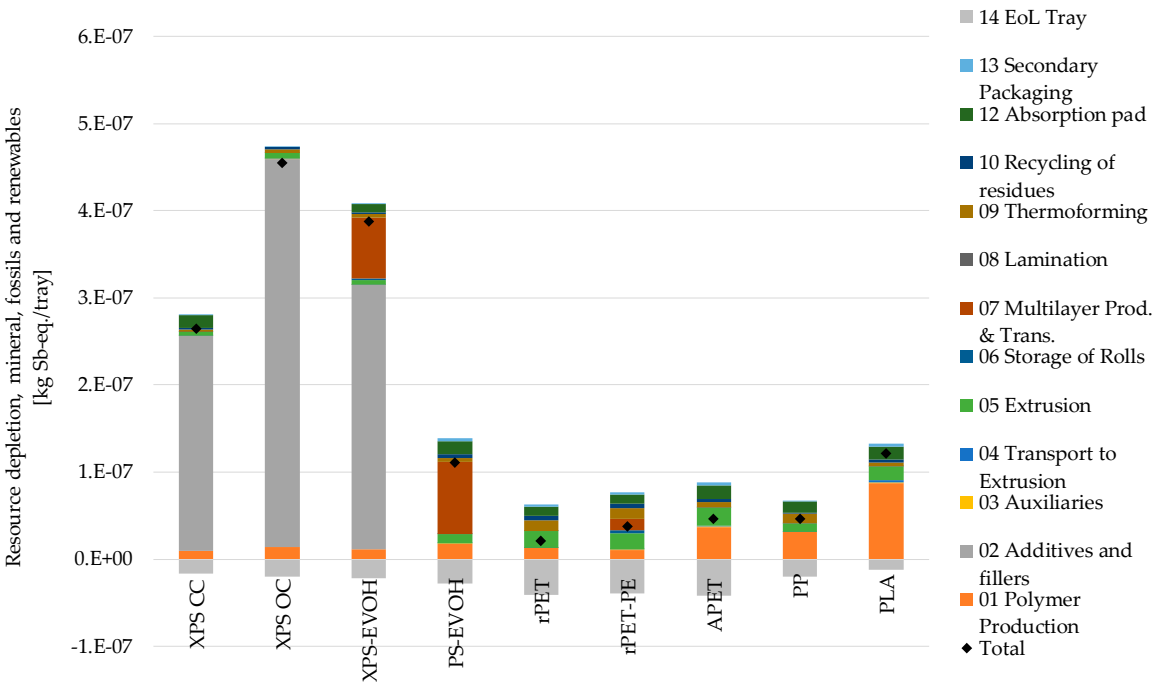


**Figure S4.** Contribution analysis of resource depletion for all investigated tray solutions.